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A set of prescriptive design principles to support community currencies as commons

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ABSTRACT

After the 2008 financial crisis, the role of money and the structure of modern monetary systems have become subject to renewed scrutiny. The existing system, marked by extensive financialisation, power concentration, and rising social inequality, is considered incompatible with social justice and ecological sustainability goals. Consequently, decentralised monetary initiatives have emerged as alternatives reshaping and rethinking the nature and governance of money. Of these initiatives, locally managed community currencies (CCs) have risen to prominence, as they view money as a commons designed to serve community needs rather than generate profit. However, the design and governance of CCs remain underdeveloped due to either too broad design principles or empirical insights lacking a theoretical foundation. This study proposes a structured set of design principles, which link theoretical insights to practical guidance. Drawing on a design science approach in a European project, we develop four actionable design principles that guide local communities in creating and adapting CCs to their respective socioeconomic contexts. By integrating insights from contemporary CC literature and practitioners' guidance research, this study offers a flexible yet structured toolkit for designing, deploying, and maintaining CCs. The framework emphasises the importance of balancing technological opportunities with community needs, ensuring the association of CCs with local realities and collective goals. This study helps redefine and design money as a democratic, socially embedded institution capable of fostering equity, resilience, and ecological transition. As such, it contributes to design science knowledge about solving the problem of societal and ecological transformation.

1. Introduction

At present, money stands at a historic juncture. In the wake of the 2008 financial crisis, a wave of activists, citizens, scholars, and grassroots initiatives had called for a revaluation of the role of money and the monetary system, which, in its current form, supported the capitalist economic order (Aglietta et al., 2016; Graeber, 2014; Ingham, 2013). This system was marked by extreme financialisation of our economy (Dardot and Laval, 2019; Morin, 2015; Turner, 2017), a related concentration of power (Vitali et al., 2011), and rising inequality (Piketty, 2013), which exacerbated social disparities (Aglietta and Orléan, 2002) and potentially impeded the necessary ecological transition (Blanc, 2024; Douthwaite, 1993; Lietaer, 2012; Kennedy et al., 2012). Scholars argue that the time had come to open what had long been considered a black box—something taken for granted—to rethink the production of money and develop a monetary system that would benefit the many rather than prioritising profit maximisation for the few (Barinaga, 2020). Meanwhile, crypto-entrepreneurs launched initiatives based on blockchain technologies, unlocking the possibilities for developing a decentralised monetary system (Diniz et al., 2019; Malherbe et al., 2019). These two efforts share the goal of developing a monetary system, which regards money as a commons and allows it to be managed by institutions other than the State or traditional markets. Barinaga (2020: 2) outlines this process as to 're-imagine, re-claim, and re-organise money along a vague ideal of a commons'. Indeed, these two approaches may reflect different ideas of the commons, with some being more market-oriented, whereas others are more militant (Meyer and Hudon, 2019). However, beyond these conceptual distinctions, the rapid rise of new decentralised currency forms is increasingly challenging the traditional monetary system (Dodd, 2015).

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Often referred to as alternative, complementary, community, social, or local currencies (Blanc, 2011; Larue, 2020; Kennedy et al., 2012) the more 'activist' decentralised forms of currencies are highly diverse in terms of scope, scale, design, digitisation, governance mechanisms, and openness to external public and private players. Lietaer and Hallsmith (2006) noted that the standard of value of these decentralised currencies may be connected to conventional monetary units, time measures, or physical assets. The mediums of exchange of these currencies can involve paper or digital formats. Additionally, the store-of-value function of those can include interest, demurrage, time-based incentives, or expiration clauses (Lietaer and Hallsmith, 2006). In terms of issuance mechanisms, these currencies differ from fully or partially backed currencies to vouchers, loyalty points, or mutual credit systems. The cost-recovery strategies of these currencies are called business models, which may comprise flat fees, transaction charges, interest levies, demurrage, or other time-related fees (Lietaer and Hallsmith, 2006). These elements, in combination, shape decentralised currencies into socio-monetary constructs, which can redefine the functions of money, emphasising relational, ecological, and redistributive values. Consequently, these currencies operate alongside traditional currencies and circulate within specific regions or communities (Lietaer, 2001). This decentralised form of currency managed by communities is referred to as community currencies (CCs) in the remainder of this paper.

CCs are characterised by significant diversity, which highlights the importance of thoughtful design for their effective development and long-term sustainability. The existing literature encompasses efforts to define design principles (DPs) for CCs. Chasin et al. (2020) developed six DPs for developing resilient and scalable digital CCs. Diniz et al. (2025) outlined DPS, which addressed the key challenges of developing CCs as commons and their potential applications for achieving the Sustainable Development Goals (SDGs). Although these efforts provide valuable insights, they present DPs as broad guidelines instead of practical, actionable tools. Chasin et al. (2020) tended to overlook the importance of governance in the design process and offered no concrete recommendations in that area. Diniz et al.'s (2025) DPs resembled broad meta-principles, which can be applied to various CC initiatives (centralised and decentralised), instead of specific, targeted design actions. Conversely, approaches offering practical guidance based on extensive empirical experience, such as those by Kennedy et al. (2012), lack a clear methodology and do not connect with established theoretical frameworks sufficiently to justify their choices.

This study addresses these gaps by proposing CC DPs, which are directly linked to actionable guidance and based on an interdisciplinary literature review. Following Seyfang and Longhurst (2013: 65), the term CCs, within the scope of this study, refers to 'the broader family of parallel money systems that exist in a range of different forms, […] organized around "not-for-profit" principles and intended to serve specific geographic communities'. These CCs are decentralised forms of money managed by communities with democratic participation of members and a bottom-up decision-making process.

This study addresses the following research question (RQ):

What are the DPs that can lead to the successful development of CCs as commons?

To answer this question, this study adopted a design science (DS) methodology for developing and evaluating a set of DPs, which can guide the sustainable development of CC initiatives. Traditionally, DS is well suited for this inquiry as it supports the creation of practical and context-sensitive solutions to complex socio-technical problems, while grounding innovation in kernel theories.

This study used a four-step DS approach to develop DPs for developing CCs as commons. First, a literature review was conducted to develop an initial set of principles (DP1–DP4) and their corresponding actions. Second, the DPs were refined through semi-structured interviews with CC development practitioners. Third, a guideline, which combined literature-informed principles with expert-driven actions, was crafted. Finally, the artifact was evaluated to verify its relevance and utility. By integrating the CAMO-based design logic (Romme and Dimov, 2021) and applying the reusability criteria proposed by Iivari et al. (2021), this study's DPs ensured theoretical rigor and practical relevance of the CC development process. This study identifies promising approaches, assesses current limitations critically, and derives key insights for structuring a DS project on CCs. This study contributes to the emerging field of DS literature and addresses the problem of societal and ecological transformation.

The remainder of this paper is organised as follows: first, Section 2 presents a review of the relevant literature. Section 3 presents the methodological framework of DS approach adopted by this study and describes the way data have been collected and analysed. Section 4 introduces and discusses the DPs resulting from this study. Section 5 discusses the theoretical and practical implications of the study findings. Finally, Section 6 offers concluding remarks and directions for future research.

2. Background and related literature

This section classifies the theoretical foundations guiding the study, divided into the following four segments. First, the processes involved in designing and launching a CC are investigated. Second, the way CCs can be understood as commons is investigated. The third segment discusses the role of digitalisation in the development of CCs. The final segment evaluates the relevance of convivial tools in supporting inclusive, participatory infrastructures.

2.1. Designing and launching a community currency

CCs are often unique in terms of modes of exchange, representations of value, geographical boundaries, ability to unite a community, and specific mechanisms—the manner in which they achieve their objectives (Blanc, 2011; Fare and Ahmed, 2017; Larue, 2020). They share the common goal of restoring money for the collective good (Telalbasic, 2017) and designing a decentralised monetary system (Barinaga, 2020).

Emerging literature on CCs provides insights from experiments with citizen-oriented currencies (Derudder, 2017; Lietaer and Dunne, 2016; Kennedy et al., 2012), such as the Eusko (Edme-Sanjurjo et al., 2020; Pinos, 2020a), the Bristol Pound (B£) (Finch, 2024; Johnson and Harvey-Wilson, 2018; Marshall and O'Neill, 2018), and the Bangla-Pesa (Bendell, 2017; Ruddick et al., 2015), as well as business-oriented currencies, such as the WIR (Stodder, 2009) or Sardex (Dini and Kioupkiolis, 2019; Motta et al., 2017). These works highlight that alternative forms of currencies are essentially complex, human-made systems (Blanc et al., 2023; Kennedy et al., 2012). They further argue that CCs are specific forms of currency created by communities through a decentralised governance process, in which decisions are made bottom-up and democratic participation is encouraged from their members.

Kennedy et al. (2012) suggested that building a community of interest should be the first step to develop a CC. Therefore, their study recommends that setting up a steering committee, ideally bringing together various stakeholders from public institutions, private sector businesses, individuals, and other associations must comprise the initial phase. The steering committee will be responsible for initiating the process of defining the goals of the CC project. This involves identifying the overall purpose and establishing the geographical boundaries and thematic scopes of the project (Diniz et al., 2025). This phase is critical and has significant consequences because the entire strategic framework of the project will be built around these goals. These objectives will guide the way collective action is organised, influence the features of the currency's design, and determine the method for assessing its outcomes. For example, if the primary purpose of the currency is to address a shortage of monetary liquidity, which is common during financial crises (Stodder, 2009), the resulting system may contain characteristics that differ significantly from those of a currency aimed at boosting social

cohesion within a specific community.

From this perspective, communities' willingness to create a CC is equally important to define their scale and scope. The scale refers to increasing the number of users and transactions within the geographical boundaries of the CC, whereas the scope implies the products and services offered by the CC (Diniz et al., 2025). As the scope and scale of CCs are inherently linked to a wide range of designs, each creating unique effects across economic, environmental, social, cultural, and governance spaces (Place and Bindewald, 2015), both must be adjusted accordingly with respect to the goals of the project.

The literature further emphasises that a minimum threshold of participants and stakeholders is essential to initiate an engagement effect (Crowe et al., 2016; Granata and Scavone, 2016). As the value of a currency essentially depends on exchanges it facilitates, it requires initiators' (coordinators and local managers) proactive involvement to mobilise and persuade a community. Marketing and persuasion techniques can also be used to emphasise that a regional currency will help improve social and economic conditions (Kennedy et al., 2012). To this end, we suggest dedicating time to engage key actors, such as local authorities, businesses, or citizen groups, to collaboratively identify local resources that can be mobilised and used as exchange currency within the trading system. These resources may include: personal skills, such as professional expertise, hobbies, and services; community assets, such as underutilised halls, vehicles, and rooms; business assets, such as surplus inventory, downtime, or services; and local authority resources, such as underused leisure centres and theatres (Kennedy et al., 2012). This step is crucial for creating an initial boost for a regional currency, as noted by Granata and Scavone (2016) and Crowe et al. (2016).

The process of building a local currency is often marked by tensions at various stages; however, these tensions can act as catalysts for values work (Peiro et al., 2025). Local currencies such as the B£ and Eusko (see Appendix A for more details) demonstrate that strong organisational capacity can lead to local success. These examples underscore the reason that communities must focus on establishing its foundation and creating self-management rules, including guidelines that support currency development. Without a well-developed collaborative governance framework within the community, any individual can impose their vision on the community. Therefore, the collective vision must be sufficiently clear and informed to inspire the community and enable alignment around shared goals (Kennedy et al., 2012). To address this issue, some authors (Barinaga, 2020; Malafosse et al., 2022; Meyer and Hudon, 2019) started conceptualising CCs as commons, based on Ostrom's theory.

2.2. CCs as commons

Ostrom (1990) suggests that commons, characterised by collective action, locally adapted rules, and self-governance, guarantee the sustainable use of limited shared resources over time. Commons comprise three dimensions—a shared resource, a community with rights and responsibilities regarding access and use, and a community governance framework (Coriat, 2015). As such, commons are defined not by the nature of goods but through specific collective governance practices.

Aligned with the definition of commons, CCs can be considered as commons, provided they are managed collectively, governed by shared rules, and aimed at the well-being of a community (Servet and Swaton, 2018). Moreover, CCs align with Ostrom's (1990) theory of commons in terms of spaces of shared governance, resource stewardship, and resistance to market forces. Unlike natural commons, such as fisheries, monetary systems are governed and actively created by communities. Consequently, governance of monetary commons encompasses the rules for accessing and using money and design and structure of the system. Factors such as the internal organisation, distribution mechanisms, and flow of money are subject to collective decision-making (Barinaga, 2020).

The empirical evidence provided by Ostrom demonstrated that local communities can manage commons sustainably through specific institutional arrangements, such as self-governance mechanisms, as these might outperform market-based and state-led regulatory models. Ostrom's (1990) eight DPs offer a valuable framework for understanding long-term management strategies for communities ineffectively managing shared resources and social systems when these are applied to informational and digital commons (Hess and Ostrom, 2003; Hess et al., 2008; Safner, 2016). These DPs include clearly defined boundaries for accessing resources and community membership, rules adapted per local conditions, participatory decision-making processes, effective monitoring, graduated sanctions, accessible conflict resolution mechanisms, and recognition of the community's right to self-organise. The last DPs underscore the significance of nested enterprises, ensuring that local governance systems are integrated within larger institutional structures when the commons extend across multiple jurisdictions or scales (Ostrom, 1990). These principles have become increasingly central, as they enable communities with long-term management of shared resources and surrounding social systems within the broader framework of socio-ecological systems (Ostrom, 1990).

2.3. Digitalisation of CCs

To match the pace with which traditional payments are shifting to digital formats, CCs are becoming a part of the digital payment platform ecosystem (Blanc et al., 2023; Johnson and Harvey-Wilson, 2018). A recent national survey involving 53 active French local currencies showed that 83.3% of these have or plan to adopt a digital format, confirming the ongoing trend towards digitisation since 2019 (Blanc et al., 2023). Diniz et al. (2019) outlines that digitalisation is emerging as one of the main trends in the CC domain. Digital CCs are effective for promoting cost reduction, improving the management of CC systems (Diniz et al., 2019), and encouraging their adoption (Johnson and Harvey-Wilson, 2018). The heavy influence of digital design choices on CCs challenge community-based practices and create opportunities for financial autonomy, control, and traceability (de Faria et al., 2022).

At present, numerous digital technologies, including mobile applications, plastic cards, and web-based platforms, support the digitisation of money. Of recent innovations, blockchain technology is driving new momentum in the evolution of the monetary system by facilitating digital encoding of currency, which incorporates complex algorithms for operation and distribution (Davidson et al., 2016; Tichit et al., 2018). For example, the first cryptocurrency—Bitcoin (Nakamoto, 2008)—offered an alternative, decentralised, open-sourced, peer-to-peer electronic cash system model, which was designed to operate independently of traditional financial institutions. By enabling trust in payment exchanges without third-party intermediaries through decentralised cryptographic protocols (Filippi et al., 2024), blockchain technology offers substantial potential for strengthening CCs (Lung et al., 2019; Pinos, 2020b).

Meyer and Hudon (2019) argued that alternative monetary systems rooted in ethical and solidarity principles might challenge dominant market systems by incorporating social values into economic practices. They suggested that blockchain technology offered an infrastructure, which can support these principles through transparent, tamper-proof ledgers and decentralised consensus mechanisms. Barinaga (2020) demonstrated the way blockchain can act as a tool for implementing and expanding the values of commons-based monetary systems, allowing currencies designed and managed by communities to meet local needs and promote democratic control over money creation. Furthermore, blockchain has proved to strengthen the commons by improving coordination among community members and reinforcing governance structures for shared resources (Hunhevicz et al., 2022; Malafosse, 2022; Van Vulpen et al., 2024). In particular, its core functionalities—tokenisation, self-enforcement, formalisation, autonomous automation, decentralisation of power over infrastructure, transparency, and codification of trust—directly facilitate collective action in

commons-based systems by supporting Ostrom's principles (Malafosse et al., 2022; Rozas et al., 2021).

2.4. Design of convivial tools

The question of tools used and technologies employed by communities in their commons-building processes also involves several other elements. The alignment between values of and tools used by a group appears essential for the effectiveness of commons (Fuster Morell, 2010; Pazaitis et al., 2017). Some studies have shown that infrastructures and tools are not neutral when it comes to collective action. The collective design of tools can help communicate shared purpose and highlight common values. For example, developing a social charter can help communities explicitly name and articulate collective ideas, claims, and practices, strengthening the co-creation process.

In case of a commons-based project, this development process involves creating user-friendly tools to manage technologies, infrastructures, and supply processes used by communities (Bollier and Helfrich, 2019). Tools that are easy to use, repair, reuse, and improve, or promote interoperability are called convivial tools (Illich, 1973). The core idea behind user-friendliness is to foster a mutually beneficial relationship with the tool, enhancing autonomy alongside avoiding dependency. A convivial tool is based on the following three main principles: it must foster efficiency without sacrificing personal autonomy, should not promote the master–slave dynamic, and expand the range of individual action (Illich, 1973).

In the CC context, a concrete example of this approach is the adoption of the Free/Libre and Open Source Software (FLOSS) philosophy and standards (von Krogh et al., 2012). FLOSS is a grassroots movement, which was initiated in the 1980s by the free software pioneer, Richard Stallman, who changed the way software was developed and shared by making source code available openly (Stallman, 2002). The FLOSS philosophy supports community-managed, commons-based projects that foster innovative modes of production (Benkler, 2006; Kostakis et al., 2023) and promote innovation based on counter-hegemonic values (Pazaitis et al., 2022; Robra et al., 2023), which emphasise adapting, repairing, maintaining, and reusing resources, such as materials, technologies, knowledge, and skills (Robra et al., 2023).

The idea of cosmolocalism (Kostakis et al., 2023) aligns closely with the philosophy of conviviality, as the former aims to leverage emerging technologies, such as blockchain and commons-based peer production, to support decentralised and sustainable modes of production. Instead of reinforcing centralised industrial models, cosmolocalism encourages designing global knowledge and technological infrastructure along with enabling local fabrication through spaces, such as makerspaces and fab labs. By emphasising local autonomy, ecological embeddedness, and creative collaboration across diverse communities, this approach supports the degrowth principles (Kallis et al., 2018). Additionally, this framework shows the way cosmolocal production can turn hyper-connectivity into a resource for sustainability instead of a source of extractive tension (Kostakis et al., 2023).

3. Research methods

This section presents research methodology followed by this study. First, the DS approach, which integrates theoretical insights and iterative development to derive DPs, has been outlined. Subsequently, the data collection and analysis procedures that support the study's inquiry, including qualitative methods employed to ensure the robustness and validity of study findings, have been outlined.

3.1. Design science approach

Considering the practical challenges of developing CCs as commons, we aimed to use a research design approach that would help solve these issues and expand the design knowledge on CCs. Therefore, DS approaches, which focus on developing artifacts to solve real problems, were considered the most suitable research approach for this study.

DS originates from Simon's (2019) concept of the sciences of the artificial, which aims to produce prescriptive knowledge in the form of design rules or principles, addressing real-world challenges faced by practitioners alongside generating rigorous scientific knowledge (Hevner et al., 2004; Romme, 2003). Of various DS methodologies, some explicitly advocate for active and systematic involvement of users and stakeholders, combined with science-based design, which relies on principles grounded in research (Mullarkey and Hevner, 2019; Pascal et al., 2013). Jelinek et al. (2008) and Pascal et al. (2013) suggest that these methodologies were particularly well-suited in terms of avoiding design approaches, which were disconnected from practical contexts, potentially neglecting local expertise and experience.

This study develops a set of DPs, which, through their complementarity, form a cohesive guide for stakeholders involved in the design, implementation, and scaling of a CC as a commons. These principles offer a practical and theoretically grounded framework for tackling the main challenges of CCs as commons, such as user adoption, governance structures, technological choices, and long-term sustainability. In particular, this study uses a DS cycle, which van Haaren-van Duijn et al. (2024) have applied in related studies conducted earlier. This highly iterative cycle is organised into the following four steps:

The first step involves reviewing the existing literature and creating an initial draft of the DPs. According to Seidel and Watson (2014), these DPs are essential for making the theory applicable in practice and assisting designers in terms of providing guidance on what to do and how to do that (Cronholm and Göbel, 2018). Romme and Dimov (2021) suggested using the contexts, actions, mechanisms, and outcomes (CAMO)-based logic as a systematic framework to develop these principles. The CAMO-based approach associates problematic contexts (C) with specific types of interventions articulated through an actor and its actions (A), which activate generative mechanisms (M) leading to desired outcomes (O). The CAMO-based logic aligns with the standards described by Gregor et al. (2020)—a complete set of DPs should clearly specify its goal, context, mechanism, and, underlying rationale (when relevant). However, these initial DPs are derived solely from an analysis of the existing literature and do not yet include practical knowledge from field practitioners. Therefore, these must be refined, supplemented, and possibly revised to better reflect practitioner insights. This iterative process is crucial to ensure that these DPs are academically sound, practical, and effective upon application in real-world situations.

The second step considers that new knowledge will emerge from practice and entails improving the initial actions. This step is critical for this research context, as numerous CC initiatives already exist. To avoid developing principles that are disconnected from the practical knowledge accumulated in the discipline, drawing on the lessons learned from these experiences is imperative.

The third step involves developing a (preliminary) design solution in the form of guidelines for actors aiming to create a CC as a commons. These guidelines comprise DPs derived from the literature review together with actions, which have been refined substantially based on knowledge of experts in this domain.

The final crucial step involves assessing the artifact created. Within the scope of this study, the artifact consist of guidelines comprising a set of DPs that outline the actions needed to reach the intended goal of developing CCs as commons. Considering the objective of evaluating the reusability of these DPs for, with, and by practitioners, this study uses the framework proposed by Iivari et al. (2021). It advocates for a minimum level of reusability assessment of the DPs by members of the target practitioner community, ensuring that the principles are theoretically sound, understandable, actionable, and applicable for individuals who wish to implement those. This framework includes the following five criteria: (1) accessibility; (2) importance; (3) novelty and insightfulness; (4) actability and guidance; and (5) effectiveness.

Similar to any DS project, the process is highly iterative and,

therefore, involves multiple cycles through the entire framework and frequent back-and-forth movements between consecutive steps (van Haaren-van Duijn et al., 2024). Accordingly, the final set of DPs presented later in this article emerged from several iterations of the complete design science cycle.

3.2. Data collection and analysis

The types of data collected to inform this DPs guide are presented in Table 1. First, a literature review, which helped us to formalise the initial DPs, was conducted. This review, which began in 2020, was continuously updated until the submission of this study. Second, semi-structured interviews with experienced, actively engaged stakeholders involved in CCs were conducted. Special attention was paid to assemble a diverse panel of participants representing the range of existing CC configurations (see details in Appendix B). These interviews explored key topics, such as project identity and goals, governance and legal frameworks, motivations for supporting basic income, the role of blockchain and digital tools, challenges faced, and recommendations for designing and adopting CCs (see details in Appendix C). Third, the refined DPs were evaluated through two focus groups. Following Tremblay et al. (2010), the purpose of these sessions was confirmatory, aiming to assess the reusability of the DPs based on Iivari et al.'s (2021) criteria. These sessions involved nine participants, meeting the lower limit recommended by Morgan et al. (1998). This limit was suitable in contexts where participants were asked to assess an artifact individually (Tremblay et al., 2010). In the first focus group, following the guidelines proposed by Tremblay et al. (2010), three of four participants had previously taken part in the exploratory semi-structured interviews. The fourth participant was a specialised researcher with experience of conducting prior analyses of various CCs and was familiar with the relevant literature (see details in Appendix D). However, no participant in the second focus group had previously participated in the exploratory interviews. We ensured that new profiles, especially local CC practitioners with less IT expertise than those in the first focus group but more practical perspectives on the actual needs of CC projects were recruited. We also invited a researcher specialising in CCs to enrich the discussion, if needed.

We facilitated these focus group sessions. After introducing the context and objectives of the session, the DPs and related actions were presented. Time was allotted to participants for reviewing the materials prior to evaluating the DPs against Iivari et al.'s (2021) reusability criteria (see Table 2 for the descriptive questions). Based on the findings of this assessment, an open discussion was conducted to elaborate on the ratings and better understand the reason that participants believed whether the DPs and associated actions met the reusability criteria. These focus group sessions were recorded and transcribed.

More broadly, this study benefitted from our involvement in the Next Generation Internet (NGI) Local for Local project, which aimed to develop an open-source digital platform for local alternative currencies. Through this project, we engaged regularly with domain experts and worked closely with six selected CC initiatives. These initiatives were chosen to represent an array of CCs across different geographical contexts (including urban and rural locations in 6 countries).

The interviews were coded using a template analysis (King, 1998).

Table 1
Overview of data sources.

Data sources	Unit
Literature review	Initial literature review in 2020, progressively updated since then
Interviews	13 interviews (see Appendix B & C)
Focus group sessions	9 experts (see Appendix D)
NGI (Horizon Europe) Local for Local project	8 researchers, 2 information technology developers, 1 legal expert, 1 coordinator, 1 communication professional and 1 independent expert in CCs

Table 2
Focus group questions based on Iivari et al.'s (2021) reusability criteria.

DPs reusability criteria	Focus group questions
Accessibility	Can you understand and comprehend the DPs?
Importance	Do the DPs address important real-world problems?
Novelty and insightfulness	Did you receive any insights from the DPs?
Actability and guidance	Can the DPs be applied realistically in practice?
Effectiveness	Can a digital CC designed using these DPs create sustainable development?

This method was selected as it was flexible and adaptable to the research needs, requiring fewer prescribed procedures than more formal options. A template analysis usually starts with predefined codes, which are also used for guiding the analysis. To refine and improve the DPs, we aimed to identify the participants' knowledge on the creation and development processes of CCs. Therefore, the template was organised around the key actions and mechanisms outlined in the DPs. Subsequently, specific themes were identified within the code assigned to each action and mechanism (see Appendix E for more details). This approach helped us to distinguish specific actions taken by local actors and connect those to the DPs.

The discussion transcripts of participants in the focus group were analysed using qualitative coding based on thematic content analysis. This method allowed for detailed and comparative analysis across the proposed DPs, highlighting areas of agreement and disagreement, demonstrating opportunities for further refinement within the framework.

4. Results

This section presents the study findings, which have been instrumental in identify the key principles for designing CCs as commons.

Following the CAMO-based logic, the actions adopted by this study were outlined using a two-step approach. First, the actions were sourced from the existing literature. Second, to ensure their practical relevance and usability, those were refined and contextualised based on insights from field practitioners. Subsequently, the resulting set of DPs and actions were presented and discussed in two focus groups, allowing for collective evaluation and validation of the framework.

4.1. Generic DP

As money faces increasing criticism for reinforcing capitalist systems and deepening social and ecological inequalities (Graeber, 2014; Aglietta and Orléan, 2002), alternative currencies that aim to reconnect economic activity with local, social, and ecological priorities (Blanc, 2024; Lietaer, 2012) have risen to the position of increasing prominence. CCs have emerged as institutional innovations, which challenge dominant monetary systems by embedding exchanges within socially meaningful frameworks (Blanc, 2011; Cauvet and Perrissin Fabert, 2018; Dissaux and Fare, 2016). Conceived as socio-monetary constructs oriented towards economic fairness, ecological responsibility, and democratic participation, CCs can promote sustainable development (Blanc, 2024; Léo, 2025; Michel and Hudon, 2015; Seyfang and Longhurst, 2013) and contribute to the SDGs (Diniz et al., 2025). The scientific knowledge drawn from the literature thus underpins the formulation of the following generic DP (DP0), which is aimed at guiding the development of context-sensitive and goal-oriented CC systems. The letters in parentheses in DP0 refer to the CAMO-based logic outlined earlier.

DP0: Within local territories (C), developing a commons-based community currency (A), by creating a community that fosters bonds and exchanges goods and services (M), can enhance sustainable development (O).

The literature review conducted within the scope of this study

suggests that the development of a sustainable CC relies on the interaction between community development and currency design (Kennedy et al., 2012). To ensure that the entire strategy, including collective organisation and currency design, aligns with the core objectives of the CC development project, the community must establish the project goals, such as its overall purpose, and determine its scale and scope (Diniz et al., 2025). These objectives are instrumental in shaping the methods used to evaluate project outcomes. Therefore, the scope and scale of the project should be rooted in the local context, ensuring that the design effectively responds to community needs and conditions.

CC practitioners frequently highlight a significant gap in public understanding about the definition of money and the way it functions, using this gap as a primary reason for their initiatives. One interviewee notes the following: '*the big paradox I see is that we use money every day, but very few people are able to define it. And so, by using a local currency, it also allows us to reclaim what money is*' (I 9). This emphasises the pedagogical role of CCs in promoting critical thinking about monetary systems. Other stakeholders note the gradual growth in societal awareness on money's systemic effects. Reflecting on the early days of an non-governmental organisation (NGO), a founder recalls: '*when we launched the NGO in the 1970s, we acknowledged that money had a significant influence on environmental problems and their growth. But at that time, people were not very aware of environmental issues. So, it didn't make sense to say, hey, guys, we have environmental problems, and we must do something about the monetary system. It was only in the late* 80s that *we started focusing on the monetary system to see if a better functioning system could compete in the market against capitalist money*' (I 10). Today, local CCs are often praised for the benefits they offer to local communities: '*yes, it has a positive impact when you launch a local currency in a region (…) on average, the turnover of a retailer in a local network increased by 8 to 13%*' (I 6). Similarly, one interviewee specified the following: '*a payment in MLC generates 1.25 to 1.55 times more revenue for the region than a payment in euros*' (I 12). However, due to the decentralised nature of CCs, which are frequently tailored to specific contexts and objectives, a significant variety is noted among CC development projects, leading to different schemes. Highlighting this aspect, one interviewee stated: '*we cannot treat local currencies as one big basket. There is diversity within them, in terms of structure and even objectives, which are beginning to become clearer*' (I 9).

Similar to any general DP, the one followed in this study is vast and lacks specifics about action modes, such as the type of solution needed to activate the generative mechanisms and the way to develop those. The purpose of subsequent DPs is to address this lack.

4.1.1. DP1: onboarding principle

Managing the exchange of CCs is essential, as these are complex, human-made systems with value depending on the exchange they create. An initial steering committee should be launched along with CCs (Kennedy et al., 2012) to kickstart a commitment effect (Crowe et al., 2016; Granata and Scavone, 2016; Johnson and Harvey-Wilson, 2018). Therefore, the DP1 proposed by this study highlights the significance of an initial effort to build a community, which offers adequate goods or services for generating exchanges.

DP1: Within local territories (C), establishing an organised steering committee (A), to leverage community assets and initiate a commitment effect (M), can enhance community engagement and foster adoption (O).

The literature review on CCs also offers specific guidance on actions that should be taken during the launch phase of establishing a successful CC system. Initiating the process by forming a steering committee comprising diverse stakeholders, such as citizens and, when possible, representatives from private businesses and public institutions is essential to. Early and active involvement of local managers and co-ordinators is essential, as their leadership can motivate and inspire community engagement (Crowe et al., 2016; Granata and Scavone, 2016; Kennedy et al., 2012). Community assets should be activated through collaboration with stakeholders to identify and leverage local resources, such as skills, hobbies, services, unused spaces, surplus goods, and underused public facilities (Crowe et al., 2016; Granata and Scavone, 2016). A compelling story that clearly highlights the practical benefits of CCs should be promoted using effective marketing strategies to generate interest and increase participation (Crowe et al., 2016; Granata and Scavone, 2016; Johnson and Harvey-Wilson, 2018; Kennedy et al., 2012). Finally, to improve community adoption, the CC development should follow an iterative process, involving prototyping and ongoing feedback (Kennedy et al., 2012).

CC practitioners confirm that successful implementation of CC requires extensive preparation, as the process involves substantial investment of time, energy, and resources. One interviewee mentions the following: '*Notably, the average time required to launch a local currency is between three and five years of work*' (I 6). Therefore, a strong foundational framework should be established at the early stage of development, with careful anticipation of potential obstacles, including changes in group dynamics, limitations in technological or managerial capacity, and weaknesses in business models. To achieve this, several CC practitioners recommend being as prepared as possible and launching '*these projects with upfront funding, a team with assigned tasks, people with the right skills, and very clear objectives*' (I 13).

Several other practitioners emphasise the critical role of early and targeted recruitment in building a diverse and sustainable community surrounding a CC. One practitioner advises as follows: '*when we talk about local currency, we say that among your first recruits, it is essential to quickly hire a professional network development manager and a private network development manager. Yes, it is not one person who does both; it is not possible*' (I 6). These experts also stress on the importance of onboarding key local actors: '*if you start, first you have your initial community, but then you must onboard shopkeepers and local institutions. I think that's important. The trigger that makes things sustainable is to incorporate municipalities, or governments, and their infrastructure within the project*' (I 7).

Furthermore, practitioners underscore that involving local participants in the project's design phase is necessary. This perspective has been captured by the call '*to work with those involved on the ground!*' (I 13). Participatory methods, including role-playing and scenario simulations, have been frequently highlighted as crucial because these enable stakeholders to explore and evaluate potential future developments before the official launch of a CC. One practitioner explains this as follows: '*We do simulations, we play serious games, we do two to three sessions like that with different audiences*' (I 7). These interactive approaches foster engagement and help identify practical challenges and opportunities, ensuring a more robust and inclusive CC launch process.

To encourage wider adoption, practitioners also highlight actionable insights and innovative strategies tailored to different contexts. External factors, such as economic crises, cultural movements, or widespread media content, can act as catalysts to boost community involvement and promote adoption. Developing physical or digital marketplaces can further lower barriers to enter the market and strengthen local economic connections. We recommend that depending on suitability, brokerage and mediation services should be employed to enhance associations between businesses and individuals within the CC network. To ensure regular use and circulation of the currency, small and medium-sized enterprises and local governments may offer the option of partial salary payments using the CC. Incorporating mutual credit systems and compensation mechanisms can support liquidity and facilitate exchange of the CC without requiring immediate monetary settlement.

Engaging public institutions with the CC development process is also essential for building trust as it supports the system's initial rollout and ensures its long-term sustainability. By distributing grants and social benefits in the CC for essential goods and services, such as food, healthcare, and education, public actors can significantly strengthen its role. To discourage reconversion of CCs into national currencies, they can also establish public guarantee funds with dissuasive exchange

rates. One of the practitioners explains this process in the following comment: '*I think local authorities must be partners (…) through solidarity vouchers or by paying part of the salaries of elected officials. This helps keep money circulating and lends credibility to the tool. (…) If we have a local authority, there can be many more projects, and we can engage in activities related to tourism, local issues, local shops, etc. Ideally, part of the subsidies should be given in local currency. Food security is also developing at the moment*' (I 12). However, despite the desire to involve public authorities, municipalities, local governments, and public institutions, CC projects often faces significant challenges. One of the interviewees agreed to this challenge as follows, '*the problem is that we haven't succeeded, even though there are a few cities where it has worked, in getting the public authorities on board in the medium term and using local currency as a tool*' (I 13). Nevertheless, beyond Europe, some notable examples testify that public authorities play a more active role in managing CC projects. For instance, '*in South Korea, the municipalities have been setting up a lot of local currencies recently. And they're doing things like giving out universal basic incomes or social benefits in the local currency. So that means there's no ideological barrier to getting involved. The money is just out there. The municipality is distributing it. And then, that money is being spent in the local economy. This is a very different approach*' (I 8). Nonetheless, these publicly managed initiatives must be distinguished from genuinely citizen-led projects. In this context, one interviewee mentioned, '*it's really a huge job to set up a local currency for a citizens' project. And a currency, not just a payment method. As we have examples of local authorities, for instance, that have set up what they call local currencies, but which are in fact just vouchers that they distribute to consumers*' (I 6).

Although the potential of CCs justifies their appeal to public authorities, these currencies safeguard their long-term independence from institutional and market pressures through citizen governance and inclusive engagement with diverse stakeholders. An interviewee said, '*In many projects, we are depending on politics. That sometimes works very well in the beginning. But at a moment, it can be tricky because it's considered a project of the other party and so on. But that's something you cannot control. What we could have done in some projects is to open things up faster, like building on multiple relationships where you're less dependent on politics, so politics feel that they are dependent on you*' (I 7).

4.1.2. DP2: governance principle

One of the requisites of setting up a viable CC involves practitioners' ability to anticipate the evolving dynamics across multiple scales—from global trends to local contexts—as well as internal shifts within the CC community itself. A study in France revealed that 37% of local currencies reported growth, whereas 33% had trouble growing, 24% were stable but functional, and 6% anticipate suspension or closure (Blanc et al., 2023). Ensuring the renewal of engagement and continuity of teams was a critical challenge for long-term viability, as approximately 25% of the CCs experienced internal conflicts—interpersonal, political, or organisational—leading to the departure of volunteers or founders and, in some cases, prolonged periods of restructuring (Blanc et al., 2023). To this end, the literature on commons—especially Ostrom's principles (Ostrom, 1990)—and the adaptations of those by the digital domain (de Rosnay, 2020; Ramakrishnan et al., 2023; Viégas et al., 2007), helped understand the way a community could create a sustainable collaborative governance dynamic. A collective strategy combined with a sustainable business model must also be co-defined based on the purpose, scope, and scale of the CC (Diniz et al., 2025; Finch, 2024; Kennedy et al., 2012).

DP2: Within local territories (C), following commons governance principles and defining a business model (A), can help establish a long-term collaborative dynamic (M), to support the long-term resilience of the CC community (O).

The literature on commons offers strong recommendations for establishing a successful CC system over time. Starting with Ostrom's eight DPs for governing commons can provide clear guidance to set up the institutional foundation. Increasing visibility within the target community and offering incentives to sustain user participation are crucial for maintaining digital commons (Ramakrishnan et al., 2023). To improve community visibility, these resources recommend using marketing techniques, such as search engine optimisation and social media. To provide incentives, these resources suggest exploring financial and non-financial mechanisms (Salehan et al., 2017).

CCs projects often experience the central challenge in terms of finding an appropriate balance within the business model. While some authors recommend systematically protecting such projects from market forces (Bollier and Helfrich, 2019), others suggest that commons can function as effective instruments for fostering local economic development and attracting external capital along with preserving shared resources (Vaccaro et al., 2009).

The business model that CCs follow appears to be intrinsically linked to governance structures, which must preserve a community's founding values and maintain CC development projects' economic viability. The example of the Eusko (see Appendix A) suggests that aligning strong ethical values and citizen-oriented governance with a business model that ensures long-term sustainability is possible. Therefore, in terms of finding the right balance within a business model, no single, definite path exists, as achieving the appropriate balance largely depends on contextual factors, particularly the level of support provided by local authorities or the state.

Although CC practitioners do not refer to Ostrom's principles explicitly, they implement governance rules and collaborative practices, which enhance the effectiveness and durability of CCs. Practitioners focus on governance structures, which promote horizontality, transparency, and sociocratic decision-making. These approaches are often executed by general assemblies or boards of directors responsible for guiding strategic decisions. For example, one practitioner highlights the importance of establishing clear decision-making processes, especially when consensus is not achieved, '*knowing how, through governance, people will be able to make decisions, if collective discussions fail, on deployment and implementation priorities*' (I 9). Such governance frameworks satisfy multiple purposes—fair workload distribution, conflict resolution, and membership accountability.

A critical challenge in CC governance involves sustaining participation and managing leadership transitions. One interviewee emphasises the tension between continuity and renewal within organisational structures as follows: '*the big challenge is getting the people who are there to stay. Simultaneously, if new people are coming in, the people who have been there from the beginning must be able to let go at some point. There's a very complicated interplay of governance and ego in associations*' (I 12). The expertise and commitment of founders and board members are considered pivotal to ensure long-term resilience of CC initiatives, '*the importance of competent project leaders is extremely important because things don't just happen by themselves*' (I 9). The deployment of a CC is not a one-time effort but a continuous process involving territorial mobilisation. This observation is supported by the following succinct statement of one respondent: '*you never stop mobilising your territory*' (I 12). To ensure organisational health, governance mechanisms must prioritise continuity, adaptability, and well-being of volunteers and staff. To warn of the risks of unsustainable engagement, a CC practitioner states the following: '*there's a phenomenon called volunteer burnout, or civic burnout. (…) People are very enthusiastic in the beginning and running around, convincing people. But at a certain point, if this is not structurally underpinned or facilitated, it's just a lot of work without so much reward or personal reward*' (I 7).

Concerning the definition of a business model, interviewees suggest that, to foster widespread community participation, initiatives should begin with inclusive strategies, which align founding members' core values with broader public expectations. To reinforce the perceived legitimacy and practical utility of a currency, a clear value proposition must be developed and communicated to all stakeholders, '*those that will last, in my opinion, must meet market demand and have a real ability to demonstrate added value for the players who will use them*' (I 9). Although

direct economic impacts may be modest, CC practitioners stress the broader social and environmental benefits, such as strengthening local social dynamics, promoting solidarity, and fostering civic engagement: '*there is no business model that works very well, and it has little real impact on the players who use it economically. However, I think it has a big impact in terms of community building, it creates a lot of things that go beyond economics, and I think it's a very powerful tool for raising awareness of local issues*' (I 13). For initiatives prioritising economic outcomes, implementing inter-enterprise mutual credit systems and brokerage services can improve liquidity and facilitate trade, '*where it does have a significant economic impact is SARDEX in Sardinia, that is very much B2B-oriented. Otherwise, I feel that it is not happening on a large enough scale to be sufficiently effective*' (I 13). Although profit generation is not the primary objective, establishing a viable economic model for CCs presents a complex challenge. One interviewee mentions that, to ensure sustainability, practitioners must emphasise the need to achieve significant transaction volumes and adopt measured growth strategies, '*compete in the market, that was really the thing, because it doesn't make sense to do something for a small group of people who are conscious of the situation*' (I 10). However, this must be balanced with the risk of undermining the community ethos by overemphasising profitability or ideological rigidity.

To encourage the adoption of CCs further, transaction fees can be eliminated, whenever possible. One of the CC practitioner interviewees recommends a hybrid model combining digital and physical transactions, '*for me, you need both. And the question of the launch depends on resources*' (I 12). Additional strategies for fostering CC engagement include implementing a reward system and setting up a public dashboard displaying the community's collective impact.

A major dilemma that practitioners experience involves the way CCs can be made accessible to potential users without alienating them through overly militant or localised messaging. One practitioner explains, '*if we want to make a difference, we have to onboard people without saying this is all about localisation. (…) The main learning from Bristol Pound was that we had created an ideological barrier to people joining*' (I 8). Therefore, to foster broader adoption and long-term sustainability, practitioners must carefully navigate these paradoxes—balancing economic viability with community values and accessibility with ideological commitment.

Regulatory- and compliance-related challenges add another layer of complexity to the implementation of CCs, particularly in terms of adhering to data protection regulations. Practitioners acknowledge their limitations in this context by stating the following: '*we're not very strong at yet—we need* support *but struggle to find the resources*' (I 6). National regulatory frameworks impose further constraints in addition to these data protection regulations. In France, for example, local currencies are exempted from oversight only if their circulation does not exceed €1 million over a specified period. Exceeding this threshold risks triggering regulatory scrutiny, a scenario that a practitioner describes as '*a critical issue*' (I 6).

To maintain long-term control over CCs, cooperative models can be explored to effectively balance economic and social value by aligning governance structures with strategies to achieve the necessary operational scale, '*we wanted to ensure that, like a charitable organisation, the platform had principles and objectives focused on environmental and social good, and that it promoted equality. This would guarantee that the platform was used for appropriate purposes*' (I 8).

4.1.3. DP3: digitalisation principle

The rise of digital payments has introduced new elements responsible for transforming the way CC organisations operate (Blanc et al., 2023; Fois Duclerc, 2023; Lung and Montalban, 2020; Malherbe et al., 2019). Digitalisation of CCs makes the operational process more efficient by lowering costs, making system management easier (Diniz et al., 2025), and encouraging widespread adoption (Johnson and Harvey-Wilson, 2018). A nationwide French survey on local currencies (Blanc et al., 2023) revealed that currencies in a mixed (paper and digital) format experienced significantly faster growth than those in a paper-only format. Moreover, mobile applications were the most popular digital solutions, with 77.8% of the local currencies either using or planning to use those. The survey also reported that, driven by cooperation among local currencies, an increasing trend was noted in using alternative software solutions since 2019.

Furthermore, the rise of blockchain technologies helps create alternative currencies by fostering trust without the use of third-party intermediaries (Filippi et al., 2024). In addition to simplifying currency issuance, blockchain technologies appear to possess the potential for enhancing the coordination and governance of commons-based communities (Malafosse et al., 2022; Rozas et al., 2021). These factors lead us to build the third DP:

DP3: Within local territories (C), using digital tools, especially blockchain technology (A), enhances trust and improves processes (M), by supporting transactions, commoning, and fostering engagement (O).

The extant literature clearly specifies several actions that CC practitioners can adopt to enhance public trust in CCs and improve commons-based processes. Considering the importance of clearly defining governance structures, the digitisation process presents a strategic opportunity to align the collective vision and reinforce community commitment (Barinaga, 2020). Scholars have also explored the way blockchain technology can be integrated into CC initiatives, supporting commoning. These studies indicate that tokenisation enables currency issuance and digital rights transfer, smart contracts facilitate self-executing agreements, decentralised autonomous organisations promote autonomous interactions, decentralisation enhances data security, transparency transforms processes, and codified trusts obviates the need for traditional intermediaries (Malafosse et al., 2022; Rozas et al., 2021).

CCs practitioners emphasise the need for establishing a robust administrative framework and operational stability before embarking on digitisation, '*it's not possible to develop a local currency if you're not on top of your accounting. So the first thing we ask when a local currency comes along is, what are your human resources? Do you have the capacity to* support *the implementation of an ERP?*' (I 6). Although transitioning to digital systems can significantly increase '*the number of members*' (I 12), digital tools alone do not guarantee increased adoption—'*contrary to what one might have thought at first, many local currencies began to believe that implementing digital technology would be simple and would lead to an explosion in usage, but they were in for a rude awakening*' (I 6). Therefore, to popularise adoption of digital tools, comprehensive training can be provided to employees and volunteers so that they can address technological complexity, and direct, in-person engagement can be facilitated—'*what encourages adoption? It's direct contact. Going out into the field. In this case, it's not a question of tools, it's a question of social relations*' (I 6).

Powered by sufficient financial, time, leadership, and IT resources, early adoption of digital tools can bring significant long-term benefits in areas, such as governance, impact evaluation, and transaction management. CC practitioners highlight some practical benefits of digitisation, '*We're promoting digital extensively right now because we struggled with the paperwork*' (I 7). Practitioners may select an existing platform or may develop a customised solution (provided that extensive IT expertise is available). One of the interviewees mentioned, '*local currencies don't have much money, so it's obviously difficult to finance developers for such a large project. (…) It is not the job of a local currency to manage an information system. Thus, it is better for it to pay for a service, a provider, than to do a bit of everything*' (I 6). This underscores the challenging role of digital service providers in the transition of CCs from traditional to digital systems. In this context, another practitioner observed, '*for a local currency association, there is a big challenge in knowing who to go to if we want to go digital*' (I 12).

When selecting digital tools, platforms that ensure trust and robustness should be prioritised—'*in terms of the tool's design, it has to be*

solid and robust because money is a sensitive subject that is taboo and anxiety-inducing(…) In any case, currency is based on trust. So people had to be able to trust the app' (I 6). Practitioners also emphasise '*the importance of combining the currency's information system with management tools that go beyond the currency itself, to ensure community management*' (I 1). They advocate for integrated functionalities, which enable comprehensive transaction tracking and financial monitoring, including data visualisation, flow analysis, behavioural evaluation, and transparent record-keeping, alongside practical tools, such as voucher tracking, digital mapping of merchant participation, and user identification systems. A lack of interoperability, such as relying on '*lots of tools that aren't connected to each other*' (I 4), can create significant operational challenges. CC practitioners also stress the crucial role of visual design and user experience in maximising adoption of digital tools, with simplicity and customisation emerging as key principles.

CC practitioners emphasise that digital solutions must have seamless transaction facilities via standard payment terminals and support euro-to-local-currency conversions through the Single Euro Payments Area transfers. Practitioners stress the importance of '*considering the needs of retailers, particularly in terms of accounting*' (I 4). For this purpose, an intuitive and engaging user interface is essential. This has been underscored by one of the interviewees as follows: '*For users, whether they are professionals or citizens, it has to be simple so that you can pay on the credit card terminal and easily make a transfer to the association in euros to get the equivalent in local currency. And then, yes, it has to be attractive and I would say sleek*' (I 12).

However, concerning the use of blockchain technology, CC practitioners have not reached a consensus. Some of them recognise its potential, noting that '*blockchain could provide a useful storage, and smart contracts could be useful*' (I 5). From this perspective, distributed ledger technologies appear to be well-suited to managing CC transactions and data. Those who have already implemented blockchain use it essentially for its transactional capabilities '*as a transaction ledger, but the currencies on it are not cryptocurrencies, they are just transactions that we record*' (I 6). They also use it for automation through smart contracts—'*smart contracts are used for payments, which govern transactions between wallets, the creation of wallets and rights (…), but also for mutual credit, where they manage the operating and transaction logic*' (I 6). Practitioners highlight the enhanced security and robustness that decentralisation can bring. One interviewee observed that decentralisation '*provides a highly secure, very low-cost solution that we can control if we want to improve it*' (I 13). Another interviewee illustrated this resilience of blockchain technology by remembering the following: '*when there was a fire at OVH in 2021 (a French hosting service)? Well, I would say that the currency continued to circulate, although we lost all our ERP*' (I 6).

However, other practitioners are critical in terms of assessing the usefulness of blockchain technology. Many interviewees reported specific problems related to '*the complexities associated with blockchain in terms of private keys; the private key is encrypted but stored online - it is not stored by the user*' (I 13). Several others emphasised the difficulty in communicating and understanding this technology—'*The problem is explaining blockchain to people. (…) When most people hear "blockchain", they think "bitcoin", they think "server farms", they think "energy", it's not environmentally friendly (…) you have to be really strong to defend it*' (I 12). The issue of digital identity also emerged as a key concern. One practitioner stated, '*a major point in favor of blockchain is anonymity. And that's just something that we are totally against because money is a community thing (…) for the main administration, it doesn't really make sense*' (I 10). This concern had been further complicated by regulatory and legal obligations related to identity and traceability. Reflecting on this, one participant explained, '*blockchain is great, it's transparent, but it's not good that everyone can access it. With Bitcoin, anyone can access it, but there is no identity management and there is no centralised register saying that a particular wallet belongs to a particular person. That's the problem because we are obliged to have that*' (I 6).

Finally, practitioners' difference of opinion about choosing blockchain technologies could be summed up in the observation by one participant who stated that it '*depends on the needs. I would differentiate based on the type of complementary currency we are dealing with. Does a local, communal, or community currency really need all that? Not in my opinion. Is it relevant for mutual credit systems? Potentially, yes, if we want to consider their future interoperability, if the objective is the resilience of the system and you want to decentralise information*' (I 9).

4.1.4. DP4: convivial principle

Scholars argue that technological choices are never neutral, as these shape participation, accessibility, and social implications of the supported systems. From this perspective, the selection of technological infrastructures is closely linked to the broader values and principles upheld by communities that design and use these infrastructures. The alignment between the values of a group and tools used by communities provides direct benefits. Infrastructure governance shapes collective action directly (Fuster Morell, 2010), and the collective design of tools can help communicate the collective purpose and highlight shared values (Calleja-Lopez, 2018). Furthermore, if the tools adhere to the FLOSS standard and/or the principle of 'conviviality' (Illich, 1973), these may promote greater autonomy and prevent servitude. In the context of CCs as commons, this implies developing user-friendly tools to manage technologies, infrastructure, and supply processes that communities use (Bollier and Helfrich, 2019). These elements led us to develop the following fourth DP:

DP4: Within local territories (C), using tools that embody counter-hegemonic values (A) to align with the shared values of the CC (M) can enhance community autonomy and collaboration among CCs (O).

Co-design sessions are recognised as vital tools for developing a community's collective knowledge, technical skills, social cohesion, and territorial sovereignty (Filippi et al., 2024; Fuster Morell, 2010). These sessions should conform to FLOSS standards, as defined by Stallman (2002), and follow Illich's (1973) philosophy of conviviality to ensure that tools and processes remain accessible, human-centred, and empowering. Moreover, the cosmolocalism framework (Kostakis et al., 2023) highlights the importance of using global digital commons for enabling localised collaborative forms of production, boosting community autonomy, ecological responsibilities, and collaborative practices.

The existing design dilemmas in blockchain can also be addressed through collective decision-making processes and co-design approaches (Conforto and Amaral, 2010; Diniz et al., 2025). These typically include privacy, incentives, governance, and tensions between individual and collective interests, considering the limits of tokenisation and quantification (Cila et al., 2020). To address these, practitioners must find a balance by customising specific parameters, which fit local contexts and values (Cila et al., 2020; Rozas et al., 2021).

CC practitioners emphasise the importance of aligning digital tools with the core values of their communities by adopting open-source, copyleft, and open-data development models rather than proprietary approaches. They argue that these principles are not merely ideological positions but represent practical strategies that enhance interoperability, reduce redundant effort, and foster collective innovation—'*the local currency ecosystem is highly decentralised, so the more open-source and transparent it can be, the better. (…) For local currency associations, open-source transparency is a core value*' (I 12). To expand on the rationale, another practitioner added, '*that's really important - doing it in open source with the idea of a digital commons. It's key. For me, it avoids the closed-code logic, which means that naturally you're going to aggregate, you're going to push other players to come and contribute*' (I 13).

However, the open-source philosophy can be vulnerable to market predation. One of the interviewees observed, '*one of our users of Cyclos in Bangladesh put a little ribbon, let's say, around Cyclos and sold it, and took seven million out of the market*' (I10), forcing to switch back to a proprietary solution. This shift from open-source to licensed software was questioned by other actors in the ecosystem. Some practitioners expressed frustration about the loss of transparency and flexibility that

had previously characterised Cyclos' open-source model—'*We no longer promote Cyclos because it is no longer open source. So, for us, it's basically a black box, and that causes us a lot of problems. When we have compatibility issues with Cyclos, we're kind of stuck having to fiddle around to get it to work because we don't really know how to use the tool*' (I 6). Several others were more conciliatory, as they recognised the constraints faced by developers and appreciated the affordability of the current model—'*with Cyclos, we have disagreements. They are no longer open source, unfortunately. But they have this social license. So, we pay one euro a year, which is nothing. Then we deploy it on a server, which maybe costs 200 euros a year. So, it's a cheap solution for us*' (I 7).

Recently, new actors have emerged with the explicit goal of providing open-source and shared tools for CCs. One of the participants reflected on this by stating the following: '*local currencies are monetary commons that belong to stakeholders, including businesses, individuals and public authorities. And so it's generally associations or cooperatives that manage them. Local currencies shared between them the tools. So we created the lokavaluto, saying, well, there are currency management tools, payment tools and marketplaces. These three levels are digital tools as digital commons, and so, following this logic, we're not going to start again with private tools*' (I 13).

Participation in CC networks is actively encouraged to promote resource sharing, joint technical maintenance, and broader stakeholder involvement, supporting the creation of resilient, shared infrastructures. One of the practitioners emphasised that this participation requires a '*more inclusive, participatory approach from the very start of the development process*' (I 1). By pooling development efforts and costs, communities can continually enhance open tools and accelerate their adoption. Application programming interfaces are frequently cited as a practical means to connect CC systems with other solutions.

Nevertheless, maintaining open-source solutions over a course of time becomes increasingly challenging. One interviewee observed, '*it's very hard to transfer knowledge between software developers. You could do documentation, but that's an extra cost. And so it takes time for a developer to get into the system, to know how to find things and get the feel of it, and so on*' (I 5). A further concern is the small size and limited funding of some CCs—'*they don't have the funding to develop as they would like to, and as soon as there's a problem, it potentially takes longer to resolve*' (I 12).

CC practitioners must ensure compliance with regulations while engaging in the development of constantly evolving legal frameworks, as regulatory constraints—especially those related to potential interoperability with initiatives, such as the digital euro—will be vital to the future viability and scalability of digital currencies. Although standardisation efforts are limited, with international players struggling to cooperate and legal compliance differing among countries, a common set of open-source standards may provide tangible benefits alongside creating spaces for local adaptations, which can foster monetary diversity—'*I subscribe to the belief that true monetary plurality can be achieved through mechanisms that vary in volume and importance at different scales*' (I 9).

4.2. Expert evaluation of DPs and associated actions

The proposed DPs and their corresponding actions were assessed using data from participants of two focus groups. The first group comprised four participants, of whom three were IT experts on CCs or were actively involved in CC projects, and one participant was a specialist researcher on CCs and information systems management. The second group included five participants, of whom four were primarily stakeholders involved in the daily management of local currencies, and one participant was an economist with specialisation in CCs. During the focus groups, stakeholders and experts (see Appendix C for complete participant profiles) applied the reusability criteria outlined by Iivari et al. (2021) to the proposed DPs and actions. The focus group results showed a generally positive response across all dimensions (Fig. 1). Participants mostly agreed that the DPs were accessible, emphasising their clarity and ease of understanding. The DPs were also regarded to be addressing important real-world challenges, with most participants assigning high or very high scores for relevance and significance. These were considered significantly insightful, indicating moderate originality. This perception possibly stems from the composition of the focus groups comprising highly experienced individuals and specialists already familiar with several insights presented by the DPs. However, the main goal of these principles is to guide new actors who may not yet have gained or accessed such field-based knowledge.

Nonetheless, the participants differed in their opinions regarding actability and guidance of the DPs, as in whether these principles can be implemented realistically in practice. Although three participants in the first focus group felt that the DPs were highly implementable, two participants in the second focus group suggested that these principles were significantly limited in terms of real-world application, emphasising the inherent challenge of translating generic principles into action across diverse local contexts and varying project goals. Notably, issues such as the daily use of open-source tools or blockchain technologies were deemed highly feasible by the first group, whereas the second group, with less technical knowledge, prioritised practicality and saw these elements as significantly less applicable. Finally, the results of assessing the effectiveness of DPs in promoting sustainable development were generally positive, as those demonstrated encouraging outcomes. By aligning these principles more closely with specific sustainability objectives and contextual conditions of each implementation situation, their potential impact can be enhanced. Overall, the evaluation showed that, although the DPs were well-designed and broadly relevant, they would benefit from increased contextualisation and more concrete, context-specific guidance for practical use and evaluation.

The focus group discussions identified several potential areas of improvement to strengthen the DPs and their related actions, enhancing the results of this evaluation.

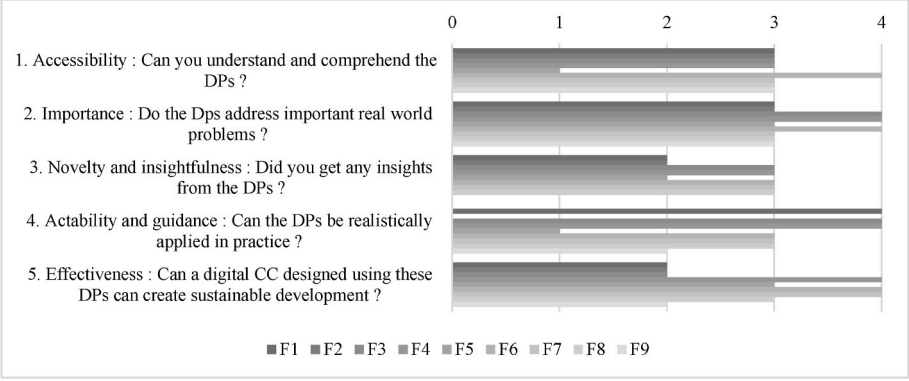

Fig. 1. Results of evaluation of the design principles.

First, the participants in both focus groups emphasised the importance of explicitly including a self-sustaining business model in the design. One participant mentioned that, without such a model, local currencies would be at the risk of stagnation or collapse once initial enthusiasm fades or external funding stops, threatening long-term viability. In particular, the participants in the second focus group highlighted the ongoing challenge of developing a CC while balancing economic growth with adherence to the currency's original value. These participants suggested that governance was the key to overcoming these difficulties. Once a particular stage of CC development would be reached, achieving this delicate balance would require structuring governance into different stakeholder groups, so that coordination could be achieved among the actors involved and a core set of values could be established. Eusko's governance framework and its charter of values (see Appendix A) have been cited as an exemplary model, as it addresses the diverse perspectives and convictions—especially regarding ecological transition—of more than 1400 professionals and numerous users. This finding reinforced the decision to combine governance and business model within a single DP—DP2. One participant compared the development of a local currency navigating the tension between community values and expansion with '*walking along a ridge line*' to metaphorically describe the process. All participants in the second focus group agreed that this metaphor was fitting and coherent.

Second, whether integrating CCs into formal public policy frameworks should be a strategic priority led to a debate among the participants. One participant in the first focus group argued that positioning CCs as tools for public policy would lead to positive outcomes, emphasising their ability to boost legitimacy, attract institutional partnerships, and ensure steady resource flows. This demonstrates that CCs might undergo a significant transition—from a grassroots innovation initiative to an acknowledged policy instrument, creating opportunities for broader adoption and scalability. However, two participants disagreed with this opinion, arguing that such a shift could expose local initiatives to the risk of being absorbed by centralised institutions, potentially weakening community ownership and diminishing the autonomy of CCs. This debate also surfaced in the second focus group. Although the participants in this group discussed the usefulness of forming partnerships with local authorities to promote economic development, they also emphasised the need of establishing an agreement committee to guide the community's strategy, particularly concerning public authority involvement. Some participants recognised the importance of fostering shared culture and joint projects between local authorities and CC initiatives, as they regarded collaboration to be crucial for strengthening legitimacy and impact of CCs. Others suggested embracing caution, as they noted from experience that decision-making bodies dominated by elected officials and public entities may lead to unnecessary tensions. They underscored that political and administrative agendas often operated on different timelines and might have interests that would differ from those of the community. They mentioned several cases in which citizens expressed distrust about using CCs in public programmes, which did not align with community values.

Third, the significance of professionalisation was discussed, with participants emphasising the importance of developing appropriate skills, governance frameworks, and financial controls. This institutional growth was regarded as a natural advancement for CC projects, fundamentally changing their operational dynamics and stakeholder relationships.

Fourth, clearly identifying the purpose of the CC was emphasised as a core requirement. The participants agreed that defining the intended outcomes, such as economic inclusion, environmental impact, or social cohesion, was essential for guiding design decisions, assessing progress, and enabling meaningful evaluation. Without clearly articulated goals, determining the success or support iterative refinement will become difficult.

Finally, technological choices in the CC development process were considered to be dependent on local needs and strategic priorities. Pointing to the high costs of coordination associated with transaction exchanges, one participant in the first focus group disagreed that launching a paper-based currency might be easier from an operational perspective. Another participant in the second focus group underscored that the management of paper-based currency was also digitalised. However, all participants agreed that early adoption of digital solutions provided with significant benefits. They also warned against rushing into technological solutions too early. This perspective was unanimously supported by the second focus group participants who were less IT-oriented and followed a more practical approach in managing CCs on a day-to-day basis. In correspondence, the discussions emphasised that counter-hegemonic and open-source values should not take priority if the core functions and services of IT solutions were inadequate or ineffective. Therefore, to ensure that tools adapt to stakeholder needs and specific conditions of implementation, a modular and context-aware approach was recommended.

Collectively, these refinements discussed above enhanced the conceptual depth and practical utility of the original DPs, offering a more grounded and adaptable pathway from initial experimentation to a long-term, scalable impact.

4.3. Results synthesis

To conclude this section, we present a final synthesis organised into two summary tables. Table 3 displays the first generic DP and the four other specific DPs supporting CCs as commons, all following the CAMO logic (Romme and Dimov, 2021). It presents the connections between DPs and the literature, offering a summarised view of their theoretical foundations. Table 4 presents the specific actions to be taken by integrating insights from academic literature and local practitioners.

5. Discussion

This section shows how the use of DS methodology enhanced the impact of this study. This section further discusses the manner in which the approach of using DS methodology advances the understanding of CCs by focusing on the role of digital tools, impact of blockchain technologies, involvement of local authorities, and interactions among practitioners engaged in processes of professionalisation in their implementation. To conclude, we position the actionable framework arising from our study as a key step forwards in addressing the wicked problem of sustainability transition at the community level.

5.1. DS added value for successful CCs

The success of any CC depends on the seamless integration of multiple interdependent factors, such as a robust digital infrastructure, active public-sector participation, and a well-designed financial stability mechanism, all supported by ongoing community engagement and transparent governance. Several methodological frameworks have been established to guide the development of CCs (Lietaer and Hallsmith, 2006; Kennedy et al., 2012). However, dedicated tools, which can enable CC practitioners to adapt their organisational strategies to changing contexts and ensure long-term sustainability, continue to be lacking. Furthermore, the relative novelty of CCs limits analytical hindsight on these phenomena, with existing approaches sometimes being too specific—or, conversely, too generic—to provide an integrated view of the actions required to establish a sustainable CC over time (Chasin et al., 2020; Diniz et al., 2025).

One of the most significant contributions of this study is the use of a specific DS methodology, which synthesises the existing theoretical knowledge and integrates the practical know-how of local currency stakeholders—knowledge essential for formulating DPs derived from the literature. This methodological approach, which combines practical and scientific knowledge, addresses a common criticism against DS methodologies—the lack of practical relevance (Chandra Kruse et al.,

Table 3
Theoretical foundation of DPs.

Design Principles	Synthesis of findings	References
DP0: Within local territories (C), developing a commons-based community currency (A), by creating a community that fosters bonds and exchanges goods and services (M), can enhance sustainable development (O).	Fundamentally, CCs promote social interactions. Through these interactions, the value of CCs generates, their collaborative dimension expands, and their impact becomes most visible. The literature linking CCs to sustainability suggests that their impact on social and ecological dimensions is significantly greater than that on economic dimensions.	(Aglietta and Orléan, 2002; Blanc et al., 2023; Blanc, 2024; Cauvet and Perrissin Fabert, 2018; Diniz et al., 2025; Dissaux and Fare, 2016; Fare and Ahmed, 2017; Graeber, 2014; Léo, 2025; Lietaer, 2012; Michel and Hudon, 2015; Peiro et al., 2025; Seyfang and Longhurst, 2013; Telalbasic, 2017)
DP1: Within local territories (C), establishing an organised steering committee (A), to leverage community assets and initiate a commitment effect (M), can enhance community engagement and foster adoption (O).	Launching a currency is integral to a community development process. Therefore, the first step involves building a community of interest. This community must organise and mobilise stakeholders, and identify resources or incentives that will motivate others to join and contribute until a significant engagement effect emerges.	(Barinaga, 2020; Bendell, 2017; Blanc, 2011; Crowe et al., 2016; Dini and Kioupkiolis, 2019; Diniz et al., 2019; Edme-Sanjurjo et al., 2020; Granata and Scavone, 2016; Johnson and Harvey-Wilson, 2018; Kennedy et al., 2012; Lietaer and Dunne, 2016; Marshall and O'Neill, 2018; Motta et al., 2017; Ruddick et al., 2015)
DP2: Within local territories (C), following commons governance principles and defining a business model (A), can help establish a long-term collaborative dynamic (M), to support the long-term resilience of the CC community (O).	CCs face persistent challenges, particularly in terms of governance and financial sustainability. Establishing a viable CC requires balancing effective governance with a resilient business model that ensures autonomy amid shifting community participation and institutional support. Conceptualised as commons, CCs can benefit from the application of Ostrom's design principles (1990) and their adaptations by digital commons to foster sustainable collective management.	(Barinaga, 2020; Blanc et al., 2023; Bollier and Helfrich, 2019; de Rosnay, 2020; Diniz et al., 2025; Finch, 2024; Hess and Ostrom, 2003; Hess et al., 2008; Kennedy et al., 2012; Ostrom, 1990, 2009; Ramakrishnan et al., 2023; Salehan et al., 2017; Safner, 2016; Servet and Swaton, 2018; Vaccaro et al., 2009; von Krogh et al., 2012)
DP3: Within local territories (C), the use of digital tools, especially blockchain technology (A), enhances trust and improves processes (M), by supporting transactions, commoning and fostering engagement (O).	CCs are increasingly transitioning to digital formats, which function as effective tools for reducing costs, improving system management, and fostering broader adoption. However, CCs are also shaped by digital design choices that challenge community-based practices and open new possibilities for financial autonomy, control, and traceability. Recent research highlights the potential of blockchain technologies in generating new alternative currencies and supporting collective governance.	(Barinaga, 2020; Blanc et al., 2023; Chasin et al., 2020; Cila et al., 2020; Davidson et al., 2016; de Faria et al., 2022; Diniz et al., 2019; Diniz et al., 2025; Filippi et al., 2024; Fois Duclerc, 2023; Hunhevicz et al., 2022; Lung and Montalban, 2020; Malafosse, 2022; Malafosse et al., 2022; Malherbe et al., 2019; Meyer and Hudon, 2019; Nakamoto, 2008; Pinos, 2020b; Rozas et al., 2021; Tichit et al., 2018; Van Vulpen et al., 2024)
DP4: Within local territories (C), using tools that embody counter-hegemonic values (A) to align with the shared values of the CC (M) can enhance community autonomy and collaboration among CCs (O).	Specific attention should be paid to the IT tools used by the community, as infrastructure governance directly shapes collective action, and the alignment of tools with shared values fosters commitment. Accordingly, commons' philosophy, free/libre open-source standards, and conviviality ensure that tools are designed for ease of use and adaptability, facilitating their repair, reuse, improvement, and interoperability.	(Benkler, 2006; Bollier and Helfrich, 2019; Calleja-Lopez, 2018; Calzada and Almirall, 2019; Cila et al., 2020; Conforto and Amaral, 2010; Fuster Morell, 2010; Illich, 1973; Kallis et al., 2018; Kostakis et al., 2023; Malafosse and Pascal, 2022; Pazaitis et al., 2017; Pazaitis et al., 2022; Robra et al., 2023; Stallman, 2002; von Krogh et al., 2012)

2022; Siemon et al., 2022; Strohmann et al., 2023). Additionally, by following the methodology proposed by Iivari et al. (2021), this study benefits from a rigorous external validation process by testing the DPs in focus groups.

Pascal et al. (2013) noted that DPs should be regarded as heuristic models, which could be adapted to specific application contexts. The digital currency models are flexible, which has helped them to be adapted to diverse regional contexts, contributing crucially to their success. For example, in metropolitan areas, the integration of payment functionality within public transport systems is a practical extension of currency use, whereas in sparsely populated rural areas, such features may be less relevant. Similarly, although identity-based currencies, such as the Eusko, thrive in areas with a strong sense of local identity, they tend to struggle in areas with weaker ties among communities.

Furthermore, as this study was part of a European project aimed at developing an open-source solution for CCs, the adoption of a DS approach showed that the main challenge was less about creating new digital tools and more about improving, maintaining, governing, or even promoting existing IT solutions, especially those within the FLOSS ecosystem. Along with questioning the traditional technology-driven innovation models, this insight emphasises the risks of redundant digital production. It argues that focus should be placed on interoperability, long-term maintenance, and context-appropriate standardisation. Such prioritisation is crucial for CCs, as they depend on localised governance and active community participation for growth. Therefore, the findings of this study suggest that, before developing a new tool, practitioners should consider strengthening and connecting the existing solutions already managed by practitioner communities and IT providers. This approach reinforces established ecosystems, supports governance-aligned design choices, and fosters digital sustainability. Additionally, these findings highlight the value added by the DS methodology—the decision may not always involve developing new IT solutions. This introduces the political choice of renouncing development as a responsible action and links this study to research on ecological redirection, raising issues involving negative commons and problematic collective heritage (Bonnet et al., 2021; Monnin, 2021).

5.2. Digital tools for CCs

A key insight that this study provides is that CCs are primarily community-driven projects. Therefore, digitalisation provides tools to facilitate transactions and includes features that support collective organisation and effective community management. The connection between payment tools and broader community management needs was often lacking. Consequently, organisations frequently compelled to improvise and develop their respective IT management solutions. In response, several citizen-focused local currencies in France decided to accumulate their resources and create a tool, which combined transaction capabilities with a comprehensive management system designed explicitly for CCs, resulting into an ERP or CRM system (Lung and

Table 4
Specific actions to support CCs as commons.

	Synthesis of actions from the literature	Synthesis of actions specified by local actors
DP0	The sustainability of a local CC depends on aligning currency design with community-defined goals, including its purpose, geographic scope, and thematic focus. This alignment ensures that CC development strategies and evaluation methods are grounded in the local context. Currency design should be based on a clear understanding of community needs.	Clarity of purpose is essential for guiding design, assessing progress, and enabling constructive evaluation. Clearly defined outcomes, such as economic inclusion or social cohesion, are crucial for determining success. Although the professionalisation of CCs suggests a natural progression, generating significant demand as well as presenting challenges for any community, it is essential to enable CCs to reach their full potential. *(Based on insights gathered from the two focus group discussions, the specifications were developed for DP0.)*
DP1	To establish a successful CC, create a steering committee of diverse stakeholders, such as citizens and, when possible, private and public sector representatives. Early involvement of local managers is the key to mobilising community engagement. The CC's purpose, scope, and scale should align with the local context. Activate community assets by leveraging local resources and promoting the CC through a clear narrative and marketing. Finally, the development process should be iterative, incorporating feedback to enhance adoption.	Implementing a CC is a time-consuming process (approximately 3 years) and requires a solid foundation to address the challenges of group dynamics. Participatory methods, such as role-playing, can help stakeholders prepare for the implementation. Early integration of digital tools offers benefits for governance and transactions. External events can drive community engagement, and physical or digital marketplaces lower entry barriers. Mutual credit systems improve liquidity and reinforce commercial relationships, with brokerage services playing a key enabling role. SMEs and local governments can offer partial salary payments using CC. Public institutions are the keys for building trust, support, and long-term sustainability. Public actors can reinforce CCs by providing grants and benefits using CCs for essential services.
DP2	Effective governance of CCs depends on democratic participation, community involvement, and sustainability. Applying Ostrom's principles strengthens governance, whereas a viable business model must align with the CC's purpose, scope, and scale.	CCs should align founding values with community needs through inclusive strategies, transparent governance, and a clear value proposition. Their success relies on committed leadership, collaborative networks, and resilient mechanisms for continuity and adaptability. Mutual credit systems, cooperative structures, and inter-enterprise specialisation models are potential tools for stimulating local exchanges. While direct economic impact of CCs may be limited, their broader benefits include strengthened social cohesion and environmental sustainability. To support viability, appropriate growth strategies must be pursued without compromising community values. Specific attention must be paid to the ongoing challenge of balancing governance with strategic development. This is essential to support the professionalisation of the CC and its economic development while preserving the community ethos.
DP3	Digitising CCs offers a strategic moment to align governance and community goals. While blockchain can support commoning through features, such as tokenisation, smart contracts, and decentralisation, its use must be guided by inclusive, democratic processes.	CC practitioners stress that digitalisation should follow the establishment of stable operations and strong governance. As digital tools alone are insufficient to foster adoption, training and in-person engagement remain essential. Technology should enhance transparency, simplify administration, and support impact tracking. Off-the-shelf platforms may be used, or custom platforms can be developed, if resources are available. Ideal systems ensure interoperability; intuitive use; banking integration; and features, such as data visualisation and user identification. Hybrid physical–digital models, zero transaction fees, rewards, and public dashboards can boost engagement. Although blockchain offers benefits, its complexity may outweigh its value; therefore, conventional digital systems are often considered adequate. Technological choices should align with local needs and priorities. A modular, context-sensitive approach is recommended to ensure that tools evolve in response to community needs and logistical realities.
DP 4	Stakeholders should collaboratively choose technologies, co-design systems, and adapt those to local contexts to ensure alignment with socio-democratic values; develop skills; and build community knowledge, cohesion, and local autonomy. Tools should follow FLOSS principles and Illich's conviviality to ensure that they remain open, human-centred, and empowering. The cosmolocalism approach promotes globally shared knowledge combined with locally grounded implementation, enhancing autonomy, sustainability, and collaborative practices.	Practitioners advocate for open-source, copyleft, and open-data models as practical strategies that boost interoperability, reduce duplication, and support shared innovation. Participation in CC networks helps pool resources and engage stakeholders in building resilient infrastructures. While mutualised development lowers costs and speeds adoption, success also depends on regulatory compliance and active involvement in shaping legal frameworks, especially regarding interoperability with future legal frameworks or systems, such as the digital euro.

Montalban, 2020). Sharing IT solutions and services through FLOSS software and IT cooperatives was a positive step forward. This study provided a better understanding of the specific needs of digital CCs, mapping them to the current ecosystem of digital CC platforms. This study strongly recommended adopting shared IT practices, which offered tools tailored to practitioners' real-world requirements, embodied convivial DPs, and was managed by organisations aligned with CC values to ensure sustainable service maintenance.

Although digital technologies facilitated payments and the management of CC systems, they introduced challenges and tensions related to adoption and scaling. These shifts required careful integration to ensure that technological tools supported local goals and governance structures. While conducting field research, we had the opportunity to gather insights from experts who had worked with or closely followed CCs, which had since shut down. This perspective helped contextualise the trajectories of specific CCs and enhanced our understanding of their sustainability, especially concerning the challenges introduced by digitalisation. Comparing this study's interview data with the 2018 case study of the B£ (Johnson and Harvey-Wilson, 2018) offered a clearer view of the factors, which led to digital adoption, as well as those, which led to its discontinuation (Finch, 2024; Marshall and O'Neill, 2018). The case of the B£ showed that, although digital infrastructure facilitated adoption, it also created tensions. In particular, participants expressed concern that, although large-scale adoption of the currency might weaken its unique identity, it could improve convenience and usability for less committed users. This paradox was central to the study's results—finding a viable business model in the digital age often depended on achieving high transaction volumes. This shift can significantly change a community's original ethos and values. The challenge was balancing the preservation of community identity and values with building a sustainable business model that retained user engagement and motivation while enhancing impact and scalability.

Recent analyses of the digitalisation of Brazilian CCs, especially the Mumbuca case in the CDB Network, highlighted the changes that came

along with shifting to digital formats (de Faria et al., 2022). In the this case, digitalisation enhanced financial independence and led to dependencies on local government, Banco Palmas, and technology providers. It changed proximity by adding control and traceability, challenging traditional community practices (de Faria et al., 2022). This case also emphasised the importance of tools and digital infrastructure in directing collective paths and maintaining a sustainable socio-technical balance (Fuster Morell, 2010). A strong interest was noted in approaches that followed convivial and counter-hegemonic methods (Illich, 1973; Robra et al., 2023) and effectively combined macro-level coordination with micro-scale involvement, as demonstrated by the commons-based peer production (Benkler, 2006) or cosmolocalism frameworks(Kostakis et al., 2023).

5.3. Blockchain for CCs

The emergence of cryptocurrencies has added to the ongoing debate on the relevance of blockchain technology for CCs. At the beginning, blockchain appeared to be an ideal solution, often described as a 'trust machine' (Filippi et al., 2024), addressing the fundamental issue concerning money. Money is essentially based on trust, particularly in terms of institutional legitimacy and the robustness of monetary system. The results of this study as well as those of the extant literature suggested that a reliable payment system was also essential in CC projects, as without reliability the adoption of a payment system might be hindered (Peña de Carrillo et al., 2018). This study confirmed Tichit et al.'s (2018) findings, which indicated that most local currency initiatives continued to rely on centralised digital solutions. However, the findings of this study showed that CC practitioners were not particularly enthusiastic about blockchain.

Contrary to the existing literature on blockchain (Malherbe et al., 2019; Pinos, 2020b), the findings of this study revealed that blockchain adoption remained significantly low among CC actors, especially when local factors are involved. Practitioners involved in daily CC operations lacked technical expertise in blockchain, and the inherent complexity of blockchain acted as a barrier to its adoption. Most practitioners had a limited understanding of blockchain's usefulness in CC projects, which was combined with a general sense of uncertainty about its relevance. The study findings showed that the use of blockchain in CC initiatives was often Manichaean—CC stakeholders who did not use blockchain tended to reject it, considering it to be unnecessarily complicated and irrelevant to their needs, whereas, projects that had adopted blockchain strongly defend their decisions, although they recognised the challenges of blockchain implementation and dissemination. In this study, the only CC that fully used blockchain technologies was the Léman currency. It employed a custom blockchain—Com'Chain—to secure transactions and enable decentralised data hosting. The Léman project actors highlighted blockchain's transparency, automation of mutual-credit processes, and ability to foster trust within a decentralised system.

To provide newcomers who are considering the launch or digitisation of a CC project with practical guidance, we recommend that they use a decision tree to address the following a fundamental question: Does the project truly require blockchain technology? If so, which design choices should be considered and selected? (see Fig. 2 below). This decision tree has been adapted from the Distributed Ledger Technology Design Decision Framework (Hunhevicz and Hall, 2020) and integrated with the framework developed by Cila et al. (2020) to address commons-oriented design dilemmas in the development of local blockchain platforms (see Appendix F for more details). This decision tree represents a key practical contribution of this DS methodology-based study to the existing literature. It offers CC practitioners a structured framework to evaluate the necessity of blockchain adoption, guiding users to determine whether blockchain is the most suitable solution or traditional approaches are be more effective. Thus, the decision tree helps prevent unnecessary exploration of blockchain technology and ensures that resources are allocated to solutions that provide real value.

As only a few local currencies use blockchain, the data provided by this study could not show the design dilemmas associated with blockchain-based tools, as discussed by (Cila et al., 2020). This study also did not observe the potential risks of neoliberal standardisation and automation through smart contracts, as highlighted by Barinaga (2020), who warned that embedding coding norms might undermine communal decision-making processes. Unlike other crypto-commons ecosystems already experimenting with digitalisation tool at a national level, the question of blockchain adoption, thus, remains open for most CC initiatives (Malafosse et al., 2022). The level of decentralisation is a primary difference among these contexts—while crypto-communities aim to operate without an official central authority beyond technical development, local commons-based CCs often benefit from legal recognition and face legal obligations. This institutional support reduces reliance on blockchain's core features and changes the way this technology is adopted in CC projects.

Owing to their specific nature and localisation, CCs are subject to distinct regulatory frameworks at European and national levels. These frameworks differ according to the type of CCs—be that crypto-oriented (Gimigliano, 2022) or designed as traditional, local complementary currencies (Gil, 2020). These legal frameworks significantly influence the potential for monetary innovation in CCs and distinguish among systems where user identity is known and the currency is backed by euros, without new money creation (Laurence, 2025), and those that are crypto-oriented, potentially enabling money creation but lacking formal legal recognition (Malafosse et al., 2022).

5.4. The key role of local authorities

The findings of this study further highlight the ongoing debate among CC practitioners regarding the dual role of local authorities as supporters and actors of governance. The B£ case demonstrates that municipal endorsement can be decisive, as evidenced by the successful negotiation of a tax payment agreement in the local currency (Johnson and Harvey-Wilson, 2018; Telalbasic, 2017). Although such institutional support is often indispensable for the durability of a currency, its reliance on government backing may compromise long-term autonomy. Therefore, striking the right balance between public approval and independent governance remains a major challenge. On the one hand, excessive institutional integration risks transforming CCs into administrative tools, potentially undermining their grassroots, commons-based character. On the other hand, public authorities must recognise the potential of CCs as strategic instruments for implementing targeted territorial policies, such as enhancing local food security, supporting SMEs, reinforcing social ties, or promoting environmental sustainability.

The commons framework offers a particularly relevant perspective—it affirms a community's right to self-organise without positioning them outside, or in opposition to, institutions, while emphasising their deep interconnections with broader social-ecological systems, as articulated in Ostrom's Social-Ecological Systems framework (Ostrom, 2009). These dynamic underscores the necessity for commons-based initiatives to preserve their autonomy and transformative potential, even as they engage constructively with institutional frameworks. Barcelona's urban and digital commons initiatives demonstrate the way commons-based governance can be operationalised through participatory co-design processes in partnership with municipal authorities (Calzada and Almirall, 2019; Malafosse and Pascal, 2022). Similarly, emerging public-commons partnerships provide a replicable model for collaboration, which combines civic initiative with institutional support while preserving self-governance and the distinctive identity of the community (Russell et al., 2023). Such frameworks offer community currency practitioners and local governments a roadmap for establishing alliances and creating innovative forms of municipalism.

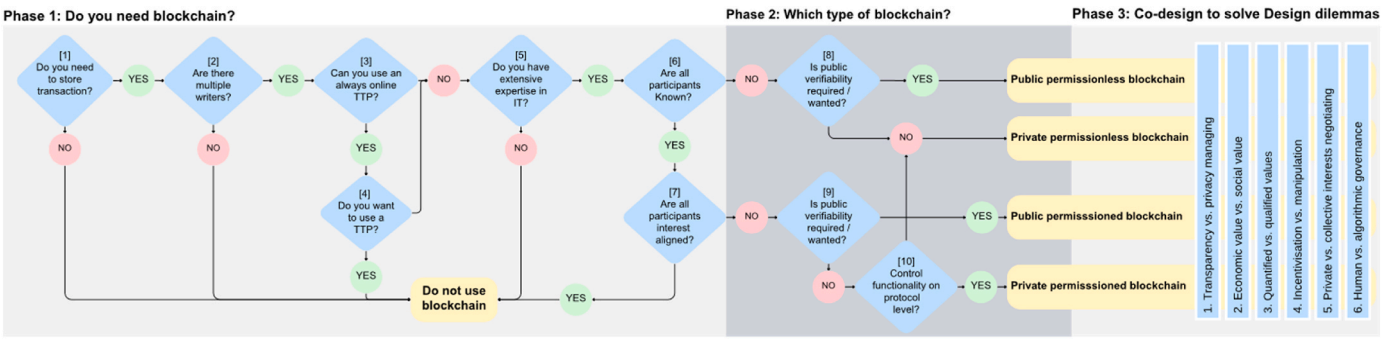

Fig. 2. Decision tree to guide the use and design of blockchain for commons-based community currencies, adapted from Hunhevicz and Hall (2020) and Cila et al. (2020).

5.5. The professionalisation cycle

The focus group conducted to validate DPs demonstrated a shared perception of an ongoing professionalisation of the CC sector, which has historically been characterised by grassroots and alternative experimentation, moving towards more structured and professional practices. This trajectory, familiar to several citizen-driven innovations, raises important questions whether the counter-hegemonic values, which initially defined these initiatives, are being preserved. As CCs become increasingly institutionalised, some community founders question whether these systems remain sufficiently alternative. This tension is evident in the rise of new monetary experiments, such as the French Ğ1 libre currency (Malafosse et al., 2022), which contrasts itself with more established local currencies, as these are criticised for being too moderate or insufficiently transformative. These developments suggest a cyclical pattern through which successive waves of innovation challenge the status quo, revitalising debates about the radical potential of monetary alternatives. Additionally, CCs sometimes embody ambivalent or problematic value systems. Not all the social values associated with local currencies are universally inclusive or constructive. In some cases, participants are influenced by conspiracy theories, identity-based ideologies, or anti-system rhetoric, which can hinder wider societal acceptance and pose challenges to community cohesion. Recognising and addressing these risks is crucial to ensure that such initiatives remain open, democratic, and aligned with inclusive social goals. The long-term alignment between the community's values (Pazaitis et al., 2022; Robra et al., 2023) and the representation that a CC design should embody are the main challenges for any initiative of this kind.

5.6. Tools for a wicked problem

This study, along with the proposed DPs and broader CC initiatives, addresses the wicked problem of societal and ecological (Brønn and Brønn, 2018; Murphy, 2012). CCs are increasingly recognised as crucial instruments in sustainability transitions, considering that monetary dynamics are frequently excluded from such discussions (Blanc, 2024; Telalbasic, 2017). Consequently, CCs have been conceptualised as tools that help advancing an ‘ecology of money’ (Douthwaite, 1999; Lietaer, 2012).

CC projects that fail to achieve long-term viability can strengthen social bonds, promote collective action, and build local capacities, enhancing the resilience of a territory. CCs provide an important educational purpose by highlighting the central role of money in modern societies and its deep connections to socio-environmental issues. Although a complete overhaul of global monetary systems may seem impossible, the rise of cryptocurrencies and spread of CCs in various forms demonstrate a growing movement. Beyond economic outcomes, the true value of these initiatives lies in establishing that current monetary systems can be questioned and redesigned to align with social values and environmental realities. Advocates, thus, promote monetary pluralism, arguing that a range of currency innovations expands potential solutions and improves local adaptability and resilience (Blanc, 2024).

6. Conclusion, limitations, and future work

To develop a framework aimed at supporting the development of CCs as commons, this study has engaged in a dialogue between theoretical insights and practitioner experience through the lens of DS. The central contribution of this study is identifying and articulating four DPs, which provide a structured foundation for guiding the successful implementation of commons-based CCs. These propositions emerged from an integrated review of the literature and empirical insights, and addressed critical issues, such as contextual alignment, stakeholder engagement, financial management, technological adequacy and governance mechanisms.

For CC project initiators and community organisers, the DPs and their associated actions offer a step-by-step checklist of considerations that have been validated through practitioner feedback. These elements have been designed to support commons-based CC projects for establishing a strong foundation. For example, the generic DP0 helps clarify the importance of aligning governance structures and system architecture with the specific goals and context of each initiative. DP1 is useful at the beginning of a project, as it guides initiators to understand the types of involvement needed from stakeholders. DP2 adds value by connecting the commons framework to the CC literature. Practitioners can increase their chances of achieving long-term sustainability by following Ostrom's principles and developing a viable business strategy simultaneously.

Although initially created as a practical guide for communities, this framework offers valuable insights for a broader range of participants considering involvement in such initiatives. For SMEs, DP1 and DP2 emphasise that their participation in CC development has been proven to be welcoming and advantageous. Features such as mutual credit systems can be especially suitable for business practices, offering operational benefits. Nonetheless, it is important to recognise that if CCs support business growth, reciprocal engagement is often expected. The Eusko case demonstrates that challenges can be designed to promote local consumption as well as strengthen community bonds. DP3 can also be useful for helping SMEs evaluate the utility of blockchain tools.

For local governments and policymakers, the framework illustrates the way public support for CCs can be organised. DP2 emphasises the importance of support from these entities, whereas the actions outlined in DP1 suggest various steps to promote CC development. DP4 is especially relevant in demonstrating the way municipalities may align with commons-based and convivial values to support innovative forms of municipalism.

For software developers and technologists, DP3 emphasises the importance of ensuring interoperability between transaction systems and community management tools (ERP/CRM). Although blockchain

technologies offer several benefits, such as automation, transparency, and decentralisation, they often transcend the actual needs of local CCs. As CC governance is usually centralised and managed internally, simpler technological solutions may be more suitable. DP3 explores the possibilities of using digital tools to implement reward systems and develop a public dashboard that displays the impact of CCs. DP4 further demonstrates the way adopting a design approach based on conviviality, FLOSS, and commons-based principles can help align technological tools with community values and facilitate the mutual sharing of resources over time.

Overall, the DPs emphasise the need to tailor a CC to its socio-economic context, ensure active participation and commitment from key actors, and possess coherent governance structures. These principles also underscore the importance of designing accessible and trustworthy digital tools, regardless of whether these tools are based on conventional systems or incorporate blockchain functionalities. Notably, the integration of collaborative governance processes, including mechanisms for rule evolution, community monitoring, and enforcement, is essential to sustain trust and long-term viability.

Nonetheless, this study has a few limitations. First, the significant diversity of CC implementations makes it challenging to produce universal recommendations. CCs emerge in varied contexts, each with distinct objectives. A rural currency aimed at reinforcing local ties differs significantly from an urban CC supported by public institutions and small businesses. Regulatory environments also vary widely. Therefore, any recommendation must be tailored to specific legal and institutional conditions. This highlights the need for CC governance and technology to be adjusted to local realities, as outcomes depend heavily on the surrounding policy landscape.

Second, although digital technologies, such as blockchain, continue to attract interest, the study findings indicate that the choice of technical tools is less critical than understanding community needs. Technology should not be the starting point. Instead, it should be assessed based on its ability to support commons-oriented goals, foster trust, and remain adaptable over time. This study, although focused highly on blockchain at the initial stage, did not provide strong evidence that these technologies would offer short-term benefits to CCs, particularly local CCs.

In conclusion, the DPs developed in this study provided clear, practical guidance for a wide range of stakeholders involved in CC projects. These principles addressed real-world challenges and were grounded in theory and practical experience. Beyond their immediate use, this contribution of the study will support efforts to develop economic systems that foster social inclusion, environmental sustainability, and democratic governance.

CRediT authorship contribution statement

Maxime Malafosse: Writing – review & editing, Writing – original draft, Investigation, Data curation, Conceptualization. **Amandine Pascal:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization.

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Declaration of generative AI and AI-assisted technologies in the writing process

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Appendix A. Insights from Literature Review on CC Experiments

By 2018, the B£ was among the UK's most resilient local currencies. Its rise is a result of post-2008 critiques of mainstream monetary systems and corporate capitalism, and Bristol's vibrant alternative culture and independent business network (Johnson and Harvey-Wilson, 2018). Johnson and Harvey-Wilson (2018) outlined five key factors influencing the use and impact of the B£. First, identity, image, and values—the B£ represents Bristol's independent and alternative identity and culture, supporting the local and circular economy. However, this strong identity may deter some who find it too radical or different. Second, social networks—people are motivated to join and use the B£ through influence and encouragement from their peers. Third, shopping habits and convenience—individuals already shopping at independent stores find it easier to use the B£. Fourth, financial management and security—the B£ directs funds into the local economy, limiting their uses and creating barriers for those with fewer security or shared budgets. Additionally, locked funds may be easier to spend. Finally, technology—the Txt2Pay system was convenient for some users but frustrating for others, with technical problems diminishing trust and enthusiasm. Nonetheless, strong values helped users persevere.

Overall, there is a paradox within the B£. While B£ appeals to users who value its alternative image and identity, it limits the use of this currency to a niche of loyal and motivated users (Johnson and Harvey-Wilson, 2018). These findings align with other research indicating that the B£ has failed to encourage additional local purchasing or production despite its regional circulation and institutional support. Instead, it has simply relabelled existing economic exchanges, with its transformative potential being limited by the persistent structural barriers inherent in traditional monetary systems (Marshall and O'Neill, 2018).

Conversely, the Eusko, launched in 2013 in the French Northern Basque Country, provides a compelling example of the way CCs can be designed (Edme-Sanjurjo et al., 2020). Managed by the Euskal Moneta association, the Eusko maintains a fixed one-to-one exchange rate with the euro. To encourage local circulation, while individuals cannot reconvert Eusko into euros, professionals can do that by paying a 5% commission fee. This system discourages reconversion and funds local initiatives. The use of the currency requires membership. Professionals must commit to two goals over two years—sourcing locally or adopting ecological practices, and promoting the Basque language through signage or training. Similar expectations apply to nonprofit associations, particularly if they receive the 3% redistribution funded by the reconversion fees. The accreditation committees play a central role in ensuring adherence to the system's principles. They verify that commitments are met and hold discretionary power to approve or reject applicants. Liquidity and regulatory compliance are maintained, with a reserve fund held at an ethical financial institution. The system is supported by a network of exchange offices, formal accounting systems, and tools for transparency and community involvement. The success

of the Eusko results from decades of local economic, ecological, and cultural efforts that built trust in the region (Edme-Sanjurjo et al., 2020). Beyond cultural identity, its growth reflects the strategic role of Euskal Moneta, which combines professional management, public partnerships, and digital innovation to expand its adoption (Edme-Sanjurjo et al., 2020).

Appendix B. Table of interviewees

ID	Profile (Expertise + Organisational Role)
I1	IT development and CC theory; network coordinator; former director of national and local CC associations; co-developer of a digital CC solution
I2	IT development expert; technical advisor for a local CC
I3	Sociology, politics, and law; elected local representative; co-founder of a local CC
I4	Associative coordination; employee managing local CC operations
I5	Software development and CC theory; CC engineer and leading CC software developer
I6	IT development; co-developer of a digital CC solution
I7	Associative coordination; NGO employee supporting CC deployment and project management
I8	Finance and management; former managing director of a community currency; author on CCs
I9	Economics and social entrepreneurship; CC developer, teacher, and ecosystem builder
I10	CC theory and software development; CEO of an NGO and CC software expert
I11	Associative coordination; employee of a local CC
I12	Social and solidarity economy; co-president of a national federation of local currencies
I13	Economy, Social entrepreneurship, CC and IT development; Co-founder of a local CC and of a software solution for CC.

Appendix C. – Semi-Structured Interview Guide

Interview Date/Place/Name of the participant

Questions for stakeholders of digital community currencies

1. What is the name of your project, and can you pitch it?
2. Where does it come from?
3. What is your role in the project?
4. What is your mission and goal in the project?
5. What are the specific mechanisms of the CCs in which you are involved?
6. What is your governance model?
7. What is your financial and law policy?
8. In what sense does your project promote money as a commons?
9. Can you describe the digital solution you are using?
10. How does the project relate to a blockchain?
11. Do you see any specific limits to the use of a blockchain?
12. What major problems and pain points have you encountered from the beginning of your operation? How have you attempted to address them?
13. Do you have any special recommendation to foster adoption of the CCs?
14. What do you think the key success factors will be if you have to design a FLOSS for CCs?
15. Which key feature design principles will you follow?

Do you agree with the following sentences? Can you explain why?[1]

- Within local territories, the development of a digital CC through the creation of a local community that fosters bonds and exchange goods and services can enhance local economic resilience
- Within local territories, an organised steering group identifying and leveraging local assets to provide an initial boost can enhance local economic resilience
- Within local territories, to enhance local economic resilience, setting up adapted and evolving should enable local communities in charge of CCs to structure their own governance that will let them deal with conflicts and adapt strategy.
- Within local territories, the use of a blockchain solution to support the local community can enhance local economic resilience
- Within local territories, local actors should be included in the co-design of CCs to address local design dilemmas during the implementation of CPR governance rules and promote adoption, which can enhance local economic resilience.
- Within local territories, a digital CC that follows free/libre/open-source standards and philosophy, ensuring efficiency without compromising personal autonomy, can enhance local economic resilience.

[1] We asked interviewees to share their opinions on the initial design principles that we defined. This helped us refine the DPs into their new version presented in the article and to merge those.

Appendix D. Expert Focus Group Composition

Focus Group	Participant ID	Profile
1st Session	F1	Co-founder of a local, citizen-led complementary currency and payment software to support it.
April 2025	F2	IT consultant expert on local currencies; Co-president of a local CC.
	F3	Economist, social entrepreneur, teacher, developer of CCs, CCs event manager.
	F4	University researcher in social sciences and technology; familiar with local currencies.
2nd Session	F5	Coordinator of a local currency; deputy mayor of a municipality using a local currency.
September 2025	F6	Teacher-researcher; expert on local currencies.
	F7	Coordinator of a local currency; expert on transition issues.
	F8	Co-president of a local currency; expertise in IT.
	F9	Co-president of a local currency; expertise in teaching and economics.

Appendix E. Overview of how the qualitative data were coded

The table below outlines the procedures used to code qualitative data from the interviews. After developing an initial set of design principles based on the literature (Step 1), we aimed to refine and validate the actions and mechanisms of the proposals using the interview data (Step 2). These steps were repeated iteratively until the final set of DPs was finalised.

Themes Actions & Mechanisms identified in DPs	Sub-themes (including higher-level codes only)
I: The development of a digital community currency **M: through the creation of a local community that fosters bonds and exchange goods and services,**	Economic Impact; Social Impact; Environmental Impact; Monetary Diversity; Money Paradox; Institutional Engagement; Market Size & Potential; Economic vs. Social Value; Historical & Cultural Context
I: an organised steering group **M: identifying and leveraging local assets to provide an initial boost**	Role of Public Actors; Launching & Methodology; Business Models & Sustainability; Initial Boost & Long-term Support; Digital vs. Physical; Challenges & Risks; Governance & Leadership; Local Context & Adaptation; Incentives & Adoption; Monetary Dynamics
I: setting up adapted and evolving **M: should enable local communities in charge of CCs to structure their own governance that will let them deal with conflicts and adapt strategy**	Governance Models; Inclusivity & Representation; Collaboration & Workload; Conflict & Exclusion; Money as a commons; Economic vs. Social Value; Business & Financial Models; Founders & Newcomers; Challenges; Digital Governance; Commons principles; Training & Continuity
I: the use of a blockchain solution (I) to support the local community **M: to address local design dilemmas during the implementation of CPR governance rules and to promote adoption**	Decentralisation & Resilience; IT Interoperability & Tools; Adoption; Blockchain; RGPD & Legal Aspects; Automation & ERP Integration; Digital Wallets & Payments; Digital Identity
I: local actors should be included in the co-design of CCs **M: to address local design dilemmas during the implementation of CPR governance rules and to promote adoption**	Bottom-Up Approach; Training & Expansion; Co-Design with Local Actors; Mutualisation; Trust; Sustainable Business Models; Inclusion & Simplicity; Reward Systems; Dashboards; Rural vs. Urban; Economic vs. Social Value; Mutual Credit; Marketplace; Digital Transformation; Long-Term Vision
I: a digital CC that follows free/libre/open-source standards and philosophy **M: ensuring efficiency without compromising personal autonomy**	Commons; Cyclos; Complexity; Protocols & Standards; FLOSS; API; Developers; User-Friendly Design; Documentation & Maintenance; Barriers to Adoption; Legal, Future and Digital Euro; Bank Integration; Funding; Decentralisation; Mutualisation; Transparency; Values; Marketplaces Lokavaluto; Local Currency; Social Impact; Adoption Hurdles; Customisation; Open Design

Appendix F. – Blockchain for CCs' decision tree

In Fig. 2, we present a decision tree designed to guide the use and design of blockchain technologies for commons-based CCs. This decision-making framework was adapted from the 'Blockchain Decision Tree' proposed by Hunhevicz and Hall (2020) and was combined with the 'Commons-Oriented Blockchain Design Framework' developed by Cila et al. (2020). The resulting decision tree is structured around three interconnected phases: Phase 1 – Do you need blockchain?; Phase 2 – Which type of blockchain?; and Phase 3 – Co-design to solve design dilemmas.

Regarding the first phase, the process of answering seven guiding questions is intended to help practitioners avoid the unnecessary development of a blockchain system. The first question, '[1] Do you need to store state?', will almost always be answered affirmatively by CC practitioners, as CCs inherently require the storage of state—namely, transaction histories, account balances, and metadata about participants and transactions. The second question, '[2] Are there multiple writers?', should similarly receive a positive answer, as CCs naturally involve multiple actors—individuals, businesses, and organisations—who issue, transact, or validate exchanges. The third question, '[3] Can you use an always-online Trusted Third Party (TTP)?', will also often be answered positively, as several TTPs can provide reliable digital infrastructures for CCs. The fourth question, '[4] Do you want to use a TTP?', highlights a key point of divergence from mainstream blockchain logic. Some CC initiatives may choose to prioritise decentralisation, security, and resilience, and therefore, aim to minimise dependence on a single authority—leading them to answer 'no' and favor blockchain-based systems. However, several CC practitioners may prefer to rely on a TTP or existing IT solution providers, perceiving this option as more straightforward and manageable, considering their resource constraints. The fifth question, '[5] Do you have extensive expertise in IT?', further refines this decision-making process and introduces a new consideration not originally included in the framework of Hunhevicz and Hall (2020). The study findings indicate that, although the ethos of CCs emphasises autonomy, transparency, and collective governance, a lack of sufficient technical expertise can make it difficult to implement and maintain blockchain solutions. In such cases, we recommend avoiding blockchain; instead, practitioners should opt for more centralised or hybrid alternatives. Conversely, when communities possess strong IT capacity, considering additional attributes—such as community identification '[6]' and alignment of interests '[7]'— becomes important which may justify rejecting blockchain if both are strongly present.

After determining the necessity of blockchain, the second phase involves defining the appropriate design options to identify the most suitable architectural configuration. In this phase, the requirements for public verifiability '[8][9]' and the degree of control desired over the protocol '[10]' are critical considerations, as they directly influence the type of blockchain to employ. A public permissionless blockchain allows any participant to read, write, and validate transactions, maximising transparency and decentralisation. A private permissionless blockchain enables open validation within a restricted network, balancing transparency with organisational boundaries. Conversely, a public permissioned blockchain offers open read access but limits participation in consensus, ensuring controlled governance with public auditability. Finally, a private permissioned blockchain restricts access and validation to selected entities, providing strong access control, confidentiality, and operational efficiency (Conforto and Amaral, 2010).

This recommendation regarding blockchain architecture must then be weighed against the specific scope and scale of each CC project in the third phase, as the design may encounter context-dependent dilemmas '1. to 6.', as illustrated by Cila et al. (2020) in their analysis of commons-oriented blockchain design. Therefore, we therefore recommend that CC practitioners further explore these dilemmas, particularly while aligning technological choices with local governance structures, community values, and scalability requirements.

Data availability

The authors do not have permission to share data.

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